A

MANUAL,

CONTAINING

DIRECTIONS FOR SOWING, TRANSPLANTING AND RAISING

THE

MULBERRY TREE;

TOGETHER WITH

PROPER INSTRUCTIONS FOR PROPAGATING THE SAME BY CUTTINGS, LAYERS, &c. &c.

AS ALSO,

DIRECTIONS FOR THE CULTURE OF SILK:

TO WHICH IS ADDED,

CALCULATIONS SHEWING THE PRODUCE

AND PROBABLE EXPENSE

OF CULTIVATING FROM ONE TO TEN ACRES,

AS TESTED BY ACTUAL RESULTS.

BY EDWARD P. ROBERTS,

EDITOR FARMER AND GARDENER.

NOT FOR OURSELVES BUT FOR OTHERS.

FOURTH EDITION WITH IMPROVEMENTS AND ADDITIONS.

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By Edward P. Roberts,

In the Clerk's office of the District Court of the District of Maryland.

INTRODUCTION TO THE FOURTH EDITION.

The three former editions of my *Silk Manual* having been exhausted, in order to be able to meet the increasing demand for it, I have been induced to publish this *fourth* edition; and in so doing I should be disingenuous were I not to acknowledge, that the distinguished favor which my work has received from the public has been grateful to my pride. But when I make this confession, I would not be understood as meaning to convey the idea, that I look upon that favor as any evidence of the merit of my labors, or that I am entitled to any degree of praise that does not intrinsically arise from the *subject* upon which it was my humble lot to treat—to the *cause*, and *not* the *advocate*, then, belongs the honor that has been meted out. While I disclaim all pretensions to authorship, I may be permitted to observe, that in all I have done to advance the interests of the Silk culture, I have had a higher object in view than personal gain—that I was urged forward in my labors by the single purpose of benefitting the public, believing then, as I do *now*, that if it shall be my good fortune to be instrumental in awakening my countrymen to a just appreciation of the importance of the Silk culture, the consolation which I shall derive therefrom will be beyond all price.

Having devoted much time to the study of the subject, and after the most mature consideration, of all its bearings, arrived at the conclusion, that there is no other branch of human industry so susceptible of being rendered tributary to the happiness and comfort of the American people—none so eminently suited to the wants and necessities of a large and deserving, though from their helplessness, suffering class of our community—I feel it a duty I owe to the public, to place those advantages before it in the best way that my very limited talents will permit, trusting to my *motives* to protect me from any invidious conclusions, which might be drawn by those to whom I am a stranger, and who, therefore, may not be able to appreciate the feelings which may have prompted me to the undertaking.

When I look, however, to the deep and absorbing interest—the profound concern, which pervades every section of our country at the present moment—and view the honest and intense spirit of inquiry, which is every where abroad throughout the land upon the subject of the Mulberry and Silk culture—when I behold the intelligent and virtuous, the enterprising and the patriotic, in all directions, daily and zealously coming into the arena as generous competitors, I can no longer doubt, that my present effort will be well received; for in this zeal, intelligence and public spirit, I behold the certain guarantie that I shall be excused for attempting to gratify a curiosity as laudable, as I trust it will prove beneficial to the best interests of the people of this union. And I am the more firmly fixed in this belief when I reflect, that there is no other country in the world richer than America in all the attributes of *climate*, *soil*, *industry*, *enterprize* and *skill*, for carrying on the business with profit to her people and wealth to the nation. Nor should the interesting nature of the business itself—the pleasurable character of the employment it offers—the means of competency it presents to superannuated males—to destitute widows and their orphans, be without their influences, in raising up friends to the culture among the wealthy classes, as besides those nobler sympathies of the human heart, which teach us to feel for others' woes, *self-interest* here comes to plead in behalf of the less fortunate classes of whom we have spoken, as there is no truer maxim in political economy, than that which teaches us to believe, *that the value of property is increased by every addition to the productive industry of a country:* nor is that other *maxim* less true, *that the real greatness of a state consists in the absence of want among its people.*

We have among us, "native born," the *Mulberry*, a sure and unerring evidence that our *soil* and *climate* are congenial to its growth; and superadded to that cir-

cumstance, *experience* has proved, that the exotic species and varieties flourish under the warm influence of our sun. With such bountiful advantages showered upon us by the Author of our being, it becomes a matter of serious inquiry, how it is that those advantages have remained so long unimproved? And especially so, when, in the early state of our colonial condition, the mother country adopted such active measures to induce us to become a silk-growing people, and that those praiseworthy exertions were continued up to very near the period when our forefathers took up arms in defence of freedom. But this surprise must cease to operate as an argument against the practicability and profitableness of the business, when it is considered, how loath men are to abandon time-honored pursuits, and how tenaciously they cling to that inherent desire so universally exising in our natures—of preferring *present* to *prospective* gains. The pioneers in the settlement of this continent, found a healthy climate and fertile lands, and as the soil made liberal *returns* with comparatively little labor bestowed, they very naturally preferred that these *returns* should be *annual*, to waiting some four or five years for the fruits of their toils in the *Silk Culture*. At that time in less than that period they could not rear a mulberry orchard to feed from. At the very onset this difficulty presented itself, and doubtless rendered comparatively nugatory, all the kind and maternal efforts of the mother country to direct their attention to it. The early settlers found growing here, two plants—*corn* and *tobacco*—the one offering the means of sustenance in their new homes, and the other immense gains as an article of export; and both insuring good returns within the year. Added to these, they brought with them those seeds of Europe, to the cultivation of which they had been accustomed from their youth. Again, at the period of which I am speaking, men were content with the *solid necessaries* of life, and but few had become so far votaries of fashion, as to adopt silk as a *general dress*, even in Britain, whence the first settlers came,—and though the more wealthy appeared in it on gala days, its use was so circumscribed as to limit its consumption. These considerations doubtless operated with much force, in conjunction with the great length of time it took to form an *orchard* for feeding, to prevent their adopting it even as a branch of their husbandry. But these motives and considerations have long since ceased to operate. The deterioration of the soil by improvident culture in the old states—the great increase of our population, the necessity for fresh sources of employment for the aged, for females, and for children of all castes and colors among agriculturists, and the fortunate introduction of the *Morus Multicaulis* into our country, are all arguments in favor of the speedy adoption of the *Silk Culture* as a branch of the husbandry of every one. It has been ascertained that the *Morus Multicaulis* tree can be profitably fed from the first year, and that each succeeding year for nine or ten, increases its lucrative capacity. The experiment of the Rev. *R. V. M'Lean*, of New Jersey, of the product of a *sixteenth* of an acre, the last year, settles the question of *profit*. From that quantity of land, as I understand, planted in roots one year old, he fed a sufficiency of worms to produce 31 lbs. 14 oz. of cocoons, which is equal to 524 lbs. 2 oz. of cocoons, or 589¾ lbs. of raw silk to the acre; and it is stated by *P. Vredenburgh*, Jr. Secretary of the *Monmouth County Silk Manufacturing Company*, that it is Mr. M'Lean's confident belief, that he had foliage sufficient to produce 50 or 60 lbs. of cocoons from the 16th of an acre he fed from,* if he had been able to procure eggs to hatch at the proper time: this latter amount would have given above 106 lbs. of raw silk to the acre; and I hesitate not to affirm, that if the sixteenth of an acre, the *first* year, be competent to do so, that its product in the *third* year would be *triplicated*.

With this brief introduction, I beg leave respectfully to submit my *Manual* to the care of the public, under the firm belief, that whatever may be said of *its merits*, *my motives* will not suffer, and to subscribe myself the public's obedient servant,

EDWARD P. ROBERTS.

*See Mr. M'Lean's letter in the latter part of this book.

PREFACE.

In the compilation of this *Manual*, the author has spared no time which he could snatch from his daily avocations, in reading various authors and essays on the interesting subject of the culture of Silk, and he takes occasion here to say, that, for the facts, directions, and instructions, which may be found in it, in addition to his own experience, he is indebted to articles in the *Encyclopedia Americana; Lardner's Cyclopœdia;* the *Edinburgh Encyclopedia; Kenrick's Orchardist;* the *observations on the Silk Worm by Wm. B. Buchanan*, Esq. published in 1828; the *treatise on the culture of Silk*, published by *Gideon B. Smith*, Esq. in 1830; the *essays on American Silk*, published in 1830, by *John D'Homergue* and *Peter S. Duponceau*, Esqrs.; *Cobb's Silk Manual*, published in 1831; *Nicholson's Farmer's Assistant; a brief treatise on the culture of Silk*, published in Boston in 1831; *the Trade and Navigation of Great Britain, considered, by Joshua Gee*, published in 1760; the *letter from James Mease, transmitting a treatise on the rearing of silk worms, by M. De Hazzi, of Munich; and the Manual of the Secretary of the Treasury on the same subject*—both of which last works were published by Congress, in 1828; the various articles respectively in those excellent periodical journals, *Fessenden's Silk Manual* and *Practical Farmer;* the *Silk Culturist;* "*The Silk Worm;*" essays in the Farmer's Register, and various other periodicals. From all of these works he has derived the most valuable information; but from the two compilations published by Congress, and the treatise by *Gideon B. Smith*, Esq. he has received the most light with respect to the culture of the Mulberry; and he feels that he should not obey the dictates of his own feelings did he not particularly acknowledge that he derived many valuable facts from the excellent and scarce work by *Joshua Gee*, Esq. as connected with the early silk culture in America. To the treatise communicated to Congress by Dr. Mease, and the letter of the Secretary of the Treasury based thereon, he owes not only the *arrangement*, but in most instances the *language* also, in which the *instructive* part of his work is dressed; nor should he pass over noticing the immense service he has derived from personal interviews with his intelligent fellow-townsman, Gideon B. Smith, Esq. and he feels it due to candor to observe, that whenever he has had to reconcile the clashing of opinions, he has turned to his sensible and judicious little work, as a common mediator, and never without receiving the most able assistance. The work of Count *Dandolo*, which forms the superstructure of the two Congressional documents, previously noticed, is so full upon every head of the subject, that after reading every thing within his command, the editor's only difficulty seemed to be to separate what might be termed the purely scientific and philosophical parts, from those of a more practical character, with a view of presenting to the agricultural community, a *Manual*, wherein all might derive the necessary information to carry on the silk culture in every branch and department, from the sowing of the Mulberry seed, and planting of the cuttings, to the reeling of the silk. How far he has succeeded he will not pretend to say, but shall leave that to others to determine—being content, himself, in the declaration,—that he has labored with a singleness of intention, to promote what he considered a great and growing *interest* of his country—an interest which if properly nurtured and improved, is calculated to secure comfort and competency to many deserving families, whose homes are now the seats of suffering and want.

MULBERRY CULTURE.

At the beginning of the Silk Culture in Europe, the *Morus Nigra*, or *Black Mulberry*, was principally used, but, after much experience, it was found that the *Morus Alba*, or *White Italian Mulberry*, was better adapted to the purposes of feeding the worm. This prefcrence, however, must be considered relatively only, and as being confined to a comparison between these two varieties, because at that period but few kinds were known there to the silk growers. We consider it eminently fortunate for the people of America, now, that they are about to enter upon the business with spirit, that another species of this invaluable tree has been introduced into our country, which is so far superior to all others heretofore known to Europeans, as to give us the most decided advantage over them; because, from the influence of long established habit, it is more than probable that those who have already established orchards of the *Morus Alba*, in France, Italy, and the other silk raising countries of the old world, will scarcely be induced to substitute the variety to which we allude, notwithstanding its great superiority; for of all men, as a body, farmers may be said to be the most loath to depart from the ways of their youth. Too often do we see them clinging to things, which the prejudice of years have rendered sacred, even against the clearest convictions of their own judgments, and in despite of the dictates of their interest. The reader need not be told by us that we have allusion to the *Morus Multicaulis*, or *many stalked Mulberry*, as its pre-eminent qualities must ere this have taught them a knowledge of its intrinsic value.

With these preliminary remarks, we will proceed to speak in all candor of the claims of this species to public confidence, and will give a few of the reasons, which, in our opinion, render it the most eligible of every species or variety of the whole family of the Mulberry.

☞THE MORUS MULTICAULIS.

This is a distinct species, and is competent to perpetuate, by seed, its own peculiar kind; but owing to the tardiness of all plants raised from seed, it would not be an object to propagate it in that way, if the seed could be obtained in quantities as a gratuity, as the facility and certainty of multiplying it from the root, from cuttings, and from layers—the rapidity of its growth when thus planted—offer so many advantages over the first named mode, as to preclude the possibility of such an idea as raising it from seed being even entertained by any intelligent individual. But let us turn to its advantages when compared with the White Italian. It can be fed from the *first year*, whereas it requires from four to five years to prepare the other kind for feeding. The leaves of the *Morus Multicaulis* is at least nine times as large as the Morus Alba, and consequently reduces the cost of *gathering* and *feeding* in the same ratio. Nearly all the leaf of the *Morus Multicaulis*, owing to the absence of woody fibre, is edible, whereas fully *one-third* of the leaf of the Morus Alba is lost, in consequence of the great quantity of stems comprised therein. The *Morus Multicaulis*, therefore, making less offal, is the most cleanly kind to feed, and as the worms delight in its consumption, preserve their health when fed thereon, and are enabled to elaborate a large quantity of beautiful silk, the question of *economy* will cease to be a debatable one, if it shall be proved that the tree is *hardy*, and adapted to the vicissitudes of our climate. Upon this point we have no doubt. On the contrary our own experience—from having grown it for

several years—justify us in asserting, that, wherever its location is an elevated one, with a light, dry soil, it will withstand the severest winters to which our climate is subjected, provided the plant has *five growing months* to mature its wood in the first season; for we contend, and do so without the fear of contradiction, that where its wood is well *ripened*, if enjoying the location and soil described by us, it is indestructible by frost, cold or snow.

We say this of the *Morus Multicaulis*, notwithstanding we are aware that persons have alleged—

1st. That it is not sufficiently hardy to stand the rigors of our climate; and

2dly. That it is not adapted to the culture of the eastern and northern states.

With respect to the first declaration, we would remark that this is by far too broad an assertion to be made of a country, whose limits are so expanded as ours, comprising so many degrees of latitude as it does, and furnishing within its own boundaries every variety of climate any where else to be found. The reader, we think, will conclude with us, that the generality of this objection takes away much of its force, and hence, that it is entitled to but little consideration, particularly as it is a well known fact, that many exotics which will not *grow* in some of the more northern states, come to the highest perfection in the southern, and that such is the difference in the time of *wheat* coming to maturity in the several states, that a man might commence harvesting in *Virginia*, and find employment of a few days duration in each of the intervening states between that and the state of Maine. With so striking a difference of temperature existing in the range of states we have described, we think it an invidious task for any one to undertake to pronounce condemnation upon so valuable a tree, when, perhaps, he had nothing more tangible to sustain him in it, than his own erring opinion, unsupported by a single fact.

With respect to the second declaration we will remark, as we have before premised, that if five growing months can be secured to the Morus Multicaulis, and it be placed on an elevated dry soil, it will withstand the rigors of the eastern and northern states. Give it but a chance to ripen its wood, and the wind, frost and snow, may do their worst, and still it will live through all. In wet springy grounds, where its vegetation will be pushed onward until arrested by frost, there will always be a large quantity of unripened wood in all trees and shrubs the first year, and common sense will teach all, that such wood contains the elements of its own destruction; but give to the Morus Multicaulis a fair chance and a high and dry, light field, and it has no occasion to ask favors of the elements.

Having spoken thus confidently upon this subject we will mention a few facts which have come under our own personal observation, the which, in our view, go incontestibly to prove all we have said.

Having heard the surmises of the Morus Multicaulis not being hardy enough for our climate reiterated until they had almost become proverbs, as we appreciated the tree highly, and were anxious to see its merits fairly tested,—in the spring of 1836, we planted fifteen hundred cuttings on a hill inclining to the north, with a western exposure. These we permitted to remain in the ground during the winters of 1836 and 1837, *without* the slightest covering; and it will be recollected that both these were peculiarly severe and trying—now the most intense cold, and then intervals of thawing—alternations of weather above all others the most destructive to vegetable life—and yet these trees remained unharmed. This experiment was a costly one to us—one that we were ill able to bear—for had we embraced the opportunity which offered itself of multiplying the product of these two years, and permitted the public to experiment for itself, we might have realized a fortune—but we felt the responsibility of our relation to that public, and having made up our mind that it was our duty to ascertain whether the tree was in reality hardy enough to withstand our winters, we obeyed the dictates of our sense of duty, and did not for a moment entertain the minor consideration of a mere personal nature.

Again, as we mention in another place, *forty-one* of our trees were carelessly left *in the field* after being taken up, in the fall of 1837, where they remained with their roots and limbs all exposed to the blasts and vicisitudes of fall, winter and spring, up to the 18th of April, 1838. These trees we planted out, and 39 of the 41 vegetated and grew as thriftily as those which had been taken up and buried all winter.

Further, we have always had a greater or lesser number of the Morus Multicaulis trees growing in open culture for the last four years, and none have ever been injured by the winter. We cut up a lot into cuttings a few days since, that had withstood the inclemency of the weather on a bleak north-western exposure for three winters, the wood of which was ripe and sound to the very extreme points of the limbs.

With the preceding evidences of the capacity of the Morus Multicaulis to sustain its vitality through all seasons, let the winters be ever so severe, we feel an abiding confidence in recommending it to every one who may desire to enter into the Silk business; and we do so the more readily, as we are sure it will save them more than fifty per cent. in the gathering of leaves and feeding alone, while, from its superior cleanliness, it will greatly add to the comfort and health of the worms.

Dr. *Stebbins*, the intelligent Secretary of *Hampshire County Agricultural Society, of Massachusetts*, in the account of his inspection of several establishments where it was grown, states, "that he had examined a standard tree of the *Morus Multicaulis*, which was set in an exposed situation, and has withstood the severity of the three last winters, as uninjured as an *elm* or *oak*, or any of the most hardy forest trees. It has attained about its greatest height, 8 feet,* and is in full life to the extremity of the topmost shoot. The grass that has grown about the roots, therefore, has not been much disturbed by hoeing, and in consequence acquired *hard wood*, the very result wanted by the cultivator of the Chinese Mulberry. In the New England Farmer, vol. 12, page 393, in an article by Mr. Wm. Kendrick, it is observed:—"this Mulberry braves the most rigorous winters of France, not having suffered in the least even during the severe winter of 1829-30. I have taken particular pains to ascertain how they have fared in the extreme north of that country, and have very lately been informed by letter from M. *Eyries*, a gentleman from Havre, that they have supported well, during *ten* years, the most rigorous winters of the north of France." Again he says:—

"Very late in the spring of 1838, more than a hundred young trees of the Morus Multicaulis were set out on the place of *V. S. Wilder*, Esq. in Boston, Worcester county, Mass. The soil springy, the exposition cold and sloping to the north; Mr. Joseph Breck, a distinguished botanist, having especial charge of these plants, has lately very critically examined them. Thus unfavorably situated and unprotected, they have borne the *last winter*, 1833-34, without injury, except only the top of the twigs. Mr. Breck is persuaded that they are even hardier than the common white Mulberry, since some hundred of the latter which stood very near, were killed half way down to the ground by the same winter."

Another correspondent of the same journal, who writes under the signature of R. advances the opinion, and "cites facts to maintain his belief, that the Chinese Mulberry is more hardy than many of our orchard, or even forest trees, but *may be killed when young, if planted in a rich moist soil.*"

In *North Carolina*, we learn from an esteemed friend and valued correspondent, Mr. *Sidney Weller*, that his trees "endured the severe frosts very well.

*In good soils and situations they have attained the height of 14 feet in this country.—Editor Manual.

The only injury is, that the top ends of some branches have been killed. In the lower part of Virginia, where some of the *Morus Multicaulis* have been introduced, we have understood they were killed to the ground. In the vicinity of Baltimore they shared a similar fate in the winter of 1834, planted in a low moist situation, though since then they have stood our winters here unscathed. But it is a fact worthy of being borne in mind—of being well considered,—that, in every instance where they were killed to the ground, the *Morus Multicaulis* shooted forth with the earliest vegetation of the spring, and grew most vigourously.

We passed through a nursery of *two thousand* of them in the early part of September, 1835, that had been killed to the ground the preceding winter, which were *then* about 8 feet high, bearing a most luxuriant crop of the most *beautiful*, *broad* and *silky leaves*, from the earth to the very verge of their topmost shoots, and presenting at a short distance the appearance of a dense and inseparable body of the most attractive foliage we ever beheld. We have been the more minute in our notice of this variety of the Mulberry, because the deep interest which has been awakened, in every part of the country, to the importance of the silk culture, and of the character for superiority, over every other of the same family, as food for worms, so universally conceded to it by every one. To those who may enter into the business extensively, where labor is a primary object, the leaf of this tree, does, most certainly, possess an advantage of immense value; being nine times as large as the leaf of the white Italian Mulberry, and having no coarse fibres, the worm consumes the whole of it, leaving no offal whatever, whereas the leaves of the white mulberry have at least one-third, in stems and gross fibres, that cannot be consumed; taking these two facts in connection, it may very safely be affirmed, that the *saving* in the cost of labor, effected by the use of the Morus Multicaulis, compared with that where those of the white Italian Mulberry are used, is, at a moderate calculation, equal to 50 per cent.: and this is an object of great moment, as we have before remarked, with those extensively engaged in the culture.

It has been said by some persons that the silk made from worms fed on the foliage of the Morus Multicaulis is superior in quality to that made from others fed on that of the white Italian Mulberry. To this opinion we do not subscribe. We believe that so far as *quality* merely is concerned, that as good silk can be raised from the foliage of the one kind as from that of the other. We have seen specimens of silk raised from each, and confess ourself as being unwilling to give the preference to either as regards color, lustre, or elasticity. In point of quality, then, it should be conceded that they are equal. But here the comparison ceases; for the superior size of the leaf of the Morus Multicaulis, its great saving in *offal*, *economy of time and labor*, in gathering and feeding, must always place it ahead of every other variety of the mulberry. It requires no more time to pull one of its leaves, which is nine times larger, than it does one of the Morus Alba; nor does it take more time to feed it to the worms on the hurdles, though it will satisfy fully nine times as many worms; thus effecting a saving both in gathering and feeding, and lessening the expense of attendants to an amount equal in itself to a very handsome profit.

The nursery of which we have just spoke as having had two thousand trees frosted during the winter of 1834, is situated in a *low*, *rich sandy loam bottom*, too moist for exotic plants of luxuriant growth to ripen well, and too much exposed to frosts by locality to afford protection. To situation, then, we believe this casualty is ascribable, andwe believe further, that Morus Multicaulis, planted on elevated dry soils, will stand the severest weather. Our *experience*, as we have before shown, justifies us in declaring it as our belief, that where the plant is in a suitable location, and has five full growing months to mature its wood in,

that the frost will not kill it. We have had yearling plants which stood the rigors of the winters of 1836 and 1837, in north-west exposures, without the slightest injury. Out of 41 trees which were taken up by our hands in Nov. 1837, and by accident left on the ground, roots and all exposed to the alternations of heat and cold during the whole of that winter, and up to April, 1838, when they were discovered and planted out—out of these 41 left thus exposed, 39 grew; thus proving the tenacity with which the Morus Multicaulis clings to life. The winter of 1837, though not an intensely cold one, was marked by considerable severity at times, and then by those alternations of heat and cold which are always so trying upon vegetable life.

From a series of facts within our knowledge, which go to establish the truth of the proposition, we unhesitatingly declare, that this is a hardy shrub.

Having mentioned that bottoms are wrong situations for mulberry orchards, we may as well remark that high grounds, or hill-sides are the best locations, and that the soils should be *sandy loams*, *sandy*, light *gravelly*, or light *stoney soils*.

Rejecting all fears about the hardiness of the Morus Multicaulis, when grown south of New York, we still adhere to the opinion advanced in our first edition, that it is best also to sow, for hedging around every Multicaulis orchard, the Morus Alba, or white Italian Mulberry. This variety comes earliest, and might under certain contingencies be found of great use.

We might here be content; but in order that every possible light may be thrown upon this part of the question, one, indeed, involving so many considerations of moment to the future prosperity of the culture, we coppy the following articles from Kendrick's Orchardist:

"Morus Multicaulis—A tree of ornament from China—a fruit tree*—a new and most valuable species of Mulberry, for the nourishment of the silk worm, which is represented as possessing such decided superiority over all others, as to be speedily substituted for them in every region of the globe. This tree has not yet to my knowledge borne fruit in America.† It was even unknown in Europe as a fruit tree, till in 1830, when for the first time, it produced its fruit in France. The fruit, according to M. Audibert, was produced in great abundance; it was long, black, and of sufficiently beautiful appearance; its taste very good, having a taste intermediate between the red and black mulberry. The tree is very vigorous and upright in its growth. The leaves, in a light, friable, rich, and humid soil, are large and cordiform, but in a dry and arid soil, they are of less size, eliptical, and without the heart-shaped indentation; their breadth is stated to be six inches, and their length eight; but in rich soils they are sometimes eight inches in breadth, and ten in length, or even more.‡ They are curled or convex on their surface, of a deep shining green, and eminently beautiful."

Some account of this plant, so lately introduced to France and to Europe, is contained in the Silk Culturist, No. 2, a valuable work published by Dr. Felix Pascalis, of N. Y. It is contained in a letter to the author from Havre, and is as follows:

Samuel Perrottet, a member of the Linnæn Society of Paris, employed by government as a travelling Botanist, returned to this port after a voyage of thirty-four months. He brought with him eighty-four boxes of various dimensions, containing one hundred and fifty-eight species of living plants, to the number of five hundred and thirty-four individuals. All these productions had been procured in the seas of Asia, or gathered on the coast, or in the lands of Cayenne. From the commencement of the present century, there had never been so vast an

* It does bear fruit, but in very limited quantities.

† It has borne fruit in this city.—*Ed. Manual.*

‡ The editor of this Manual has grown leaves 11 to 13 inches.

importation; one so extensive in number, for rare genera, species and families, and vegetable productions, or their seeds. All of them passed under my examination, and they rather appeared to have come out of a green house than from a ship.

"In this immense collection was the Morus Multicaulis, thus called by Perrottet; for the first time ascertained to be the real Chinese Mulberry, Morus Alba Sinensis, of which every silk grower and culturist should endeavor to multiply the species. It has been deposited in the Royal Garden. Monsieur Perrottet says that it grows with many shoots from the roots, with tender stems, and large foliage, of a much more nourishing nature than the European Mulberry.

"Chinese inhabitants assured him, that to this tree, the disciples of Confucius are indebted for the prosperity and solidity of their empire.

"The Morus Multicaulis is already propagating in France, and probably will be substituted and preferred to all the other varieties. Among the other qualities of the plant, it is affirmed in China, that a less quantity of this foliage is required for the precious insects, than of that which we are obliged to provide for them. Monsieur P. has left the tree in Cayenne, where it is now flourishing in dry and barren soils."

Remarks on the culture and uses of the Morus Multicaulis by M. Perrottet, Agricultural Botanist, and Traveller of the Marine and Colonies—extracted from the "Annals of Fromont:"

"The Morus Multicaulis, which we noticed for the first time in the 'Annals de la Societie Linnenne de Paris' for 1824, appears to have originated in the elevated regions of China; from whence it has been disseminated throughout the low plains near the sea shore. It is believed it is cultivated in all parts of that vast empire, where the culture of the silk worm is an object of commercial importance. From Canton it was introduced into Manilla and all the Islands in the Asiatic Archipelago, where it was only cultivated for ornamenting gardens. The Chinese are entitled to the credit of this introduction, who in emigrating from their country have from motives of industry, endeavored to multiply it, that they might render it useful to them, in the new country of their adoption.

"The fortunate discovery of this precious shrub occurred in the garden of a Chinese cultivator at Manilla, who, after having informed us of its properties, and the important purposes for which it was used in his own country, yielded to our solicitations and sold us two bushels for ten Spanish piastres, assuring us that he had introduced it into Manilla, where it has been considerably extended.

"In August we brought it from Manilla, the capital of the Phillipine Islands, and first introduced it into the Isle of Bourbon, from thence into Cayenne and France. At a later period it was sent from Cayenne to Martinique, and from France to Guadaloupe, and also to Senegal, where it has been considerably multiplied. The numerous plants which are already disseminated in the divers climates of Africa, America and Europe, have been all produced from the two individuals, which we procured at Manilla.

* * * "Among the number of mulberries now cultivated by the Chinese, for the education of silk worms, the Morus Multicaulis appears to be the most esteemed of all, not only for the facility with which it is propagated and grows, but still more for the essentially nutritive property which the leaves possess. We have been enabled to verify this important fact during the five years which we passed in Senegal. * * * The characters which essentially distinguish this mulberry from the other varieties, are those which result, 1st, from the remarkable property which the roots possess of throwing up numerous small flexible stalks, without forming a principal trunk; 2d, from the remarkable development which the thin, tender, and soft leaves speedily acquire, and the promptitude with which they are renewed; * * * and 4th, and lastly, from the extraordinary

facility with which the stalks and branches strike root, as cuttings, without particular care, even before they have acquired a ligneous consistence.

* * * "Besides the advantages which we have already named, we may still add, that they are admirably calculated for forming regular plantations; it not being natural to grow tall, or form any trunk, properly so called; they can be placed very near without an injurious effect; and by heading down the stalks annually near the ground, a rich vegetation is produced, with a complete development of vigorous branches and leaves; and finally it is easy to multiply them by thousands from the roots in the course of a year, and to form vast and regular plantations of them the second. But a few years then are sufficient to support an immense quantity of silk worms, and that with the greatest facility, as they are reproduced in a manner almost indefinite. * * * Regular plantations of it can be formed without difficulty, by planting the shrubs at a distance of six or eight feet from each other, a space sufficient for the extension of the branches, to facilitate the culture and for collecting the leaves. This last operation is so much facilitated by the flexibility of the stalks, that a child is sufficient for furnishing the food of a large establishment of silk worms.

Climate, Soil, &c.—* * * "This species will be readily acclimated in Europe; because it originated in an analogous region as to climate, to that which we inhabit. It appears not to suffer from the excessive cold of the northern, or the intense heat of the intertropical regions; for the plants deposited in the gardens of the government at Cayenne, acquired in the space of eight months a truly remarkable developement, and at the time of our departure from that colony, in June, 1823, they were clothed with leaves of an extraordinary size. Those also which we cultivated at Senegal, although situated under a dry and scorching sun, and planted in an arid soil, offered an appearance sufficiently satisfactory, but they had acquired less development in all respects, than those which have vegetated under the humid climate of Guiana. It appears expedient then, that plantations of this mulberry should be made upon a humid rather than a dry soil, to obtain in all respects a satisfactory result.*

* * * * "Besides, this mulberry braves the most rigorous winters. We saw on our arrival at Havre, in July last, in the field of M. A. Eyries, plants, which had endured, in the open ground, the winter of 1828, and which appeared vigorous and beautiful."—Thus far M. Perrottet.

On this last and other points, let us now hear the testimony of M. Poiteau in the *Annales d'Horticulture*, 1830.

"By the information which we receive from all quarters, it appears, that this mulberry is destined to replace the common white mulberry, every where, for nourishing silk worms; its property of continuing low and bushy, so that the leaves can always be gathered without a ladder; and the large size, abundance, and tenderness of the leaves cannot fail to give it a decided preference. It has been sufficiently ascertained, that they are eaten with avidity by the silk worms, and that the silk which they form is of the first quality. This mulberry has not suffered in the least from the rigors of the last severe winter.

"The zealous traveller, who has given to France, America, and Africa, this precious plant, has acquired a just claim to public gratitude, and it is not only easy, but proper, to give him at this time a proof of it, by affixing his name to the tree which has given him celebrity, and which will contribute so much to the prosperity of French industry." * * * *Note to the Perrottet Mulberry*, (*Morus Multicaulis.*)

M. Audibert is also decidedly of the opinion that the best mode of cultivating the *Morus Multicaulis*, for the support of silk worms, is in hedges with low

* [This is contrary to the present experience, so far as the quality of the silk is concerned.—Ed. Farmer and Gardener.]

stock. M. Barthere of Toulous in the south of France, who has considerably extended their cultivation, fully coincides in the same opinion; and is confident that in grounds and vineyards which could hardly give two per cent. this tree will now ensure ten per cent.

This tree, according to M. Perrottet and Dr. Deslongchamps, is easily propagated either by layers, by cuttings, or even by cuttings of a single eye, placed beneath the surface and shaded from the noonday sun.

The experiments instituted at Paris by Dr. Deslongchamps, have confirmed all that had been previously asserted respecting the quality of the silk produced by this plant; he has further stated that the cocoons, made by the worms fed only on this plant, are even rather heavier.

Dr. Felix Pascalis in an article in Silliman's Journal of Science, for July, 1830, after informing us that in the preceding March he has received two plants of this mulberry from France, has added—"After the discovery of this plant, a doubt no longer exists, that two crops of silk may be raised in a single season."

At Madam Parmentier's Horticultural establishment, two crops of silk was produced in the summer of 1832. The first were fed promiscuously on the *Morus Multicaulis*, *Morus Alba*, and other mulberries. The cocoons thus produced were about two-thirds white and the remainder of an orange color. A suitable portion of these cocoons were collected for seed, having no regard to color:—These being subjected to the hatching process, produced a second crop the 30th July. These last were fed exclusively on the *Morus Multicaulis*: they passed through the different stages of their larvæ existence in the short space of 26 days. The cocoons which were obtained from this second crop were of a *much larger size* than those of the first crop, but what is of more consequence, *they were of the whiteness of snow, and have a most beautiful shining appearance.*—(See New England Farmer, vol. xi. No. ii.) At Madam Parmentier's in 1831, I witnessed the silk worms feeding with avidity on the leaves of the Morus Multicaulis, and was informed that they had left eleven other species of mulberries to feed on this. At that place, we are also informed, the Morus Multicaulis has withstood the rigor of the last six winters, uninjured and unprotected. Although being possessed of an active and prolonged vegetation, it is not to be expected that the unripened wood of the tender tips, should always escape.

I introduced this plant to Massachusetts in the spring of 1831, from the Messrs. Prince of the Linnæan Botanic Garden, Flushing; I also received plants of the same from Madame Parmentier's of Brooklyn, L. I. and I have also received them from France from M. Andre Michaux, author of the *American Sylva.*"

Having dwelt so copiously upon the Morus Multicaulis, it is but fair that we should speak a little in detail upon the Morus Alba.

The White Italian Mulberry, or the Morus Alba, of Linnæus, is a native of Asia, and was introduced into Italy, by some of the survivors of the last crusade. *Oliver de Serris* relates that the French who accompanied Charles the eighth, in his invasion of Italy, in 1494, being struck with the abundance of the trees in that country, and with the culture of silk, caused it to be introduced into France. It is mentioned as a very singular instance of the longevity of this tree, that in 1802, *Faugas de Saint Fond*, saw the original one, around which M. *Lachaux*, to evince his respect for this *monument* of agriculture, and parent of the White Mulberry tree in France, had built a wall; there are several species of this tree, and numerous varieties, the result of cultivation, soil, climate and the play of nature. The forms of the leaves are extremely variable. M. *Audibert*, an experienced cultivator in France, says, "that the same tree will have leaves divided into several lobes, when young, and, when it becomes old, they will be entire. Others have the second crop of leaves differently formed from the first; some again have entire leaves in the spring, and lobed leaves in the autumn. Hence it

is extremely difficult to assign positive characters to the different varieties, particularly when they shew no diversity in appearance, except in the shapes of the leaves.—Its superiority over every other variety of the Mulberry, *except the Morus Multicaulis*, consists in this: It is clothed with leaves *fifteen* or *twenty days* earlier than the others—the silk worms, therefore, come quicker to maturity and are preserved from the inconvenience of the hot season. The White Italian Mulberry, moreover, not only grows more rapidly, but has a more abundant foliage, and the leaves are more delicate and more nutritive; whence the silk becomes handsomer and of better quality. But there is a considerable difference in the quality of White Mulberry trees. Count *Dandolo*, the great silk rearer of Italy, considers those best that grow in Lombardy, under the name of *Folia Giazzola*, and *Folia Doppia*, the leaf of which contains five different substances: 1st, the fibrous substance; 2d, coloring matter; 3d, water; 4th, the saccharine substance; and 5th, the resinous substance. The saccharine matter is the most essential part in the nourishment of the silk worm.

As botanists place the White Mulberry tree in the class of dioecious plants, or such as have barren or male flowers on one individual, and fertile or female ones on another of the same species, it is thought by some that it would be convenient to plant exclusively, *male* Mulberries, which they say afford the advantage that, not only on stripping them, the berries do not embarrass the operation, or cause a diminution of its product; but that the worms in their last age, are not exposed to be fed on leaves affected by the glutinous substances of the berries, which would injure their health. Moreover, the male trees keep for their foliage all their juices; whence their leaves are in greater quantity, and of a better quality; we, however, believe that there is more fancy,—more theoretical pride—than well grounded opinion in this, and therefore reject it, resting under the firm conviction that no injury whatever can result from the presence of *females* among the males of the tribe.

SOIL AND SITUATION.

The nurseries, as well as the large and small Mulberry plantations, require a sunny exposure, and spots well sheltered against strong cold winds. Therefore, declivities, or hill sides, descending towards the east or southeast, and secured by woods or groves, are proper; as also, all spots protected by artificial plantations and buildings. The trees should never be planted in marshy or low grounds; 1st, because they would be more exposed than on elevated situations to the injurious influence of cold and frosts, and 2dly, because worms fed from leaves gathered from trees in such situations, owing to the superabundance of aqueous matter in them, do not yield silk either as lustrous or tenacious, and 3dly, from the absence of saccharine matter, the worms are not as healthful, nor do they give as much silk. Next to the soil before described, a calcareous sandy clay is to be preferred. A heavy clay, or fenny, marshy earth, are especially unsuitable, because in such situations the bark becomes covered with moss, and the trees are slow in their growth, liable to diseases of the heart, and to be killed by the intense cold of winter, when the plant is young, and before its exterior coating and wood become hardened.

A single remark with respect to the soil will be sufficient. If it be not in good tilth, it should be manured in the *hole*, if in standard trees, or in the drill if in hedge rows, with a compost comprised of one-eighth lime, three-eighths mould or decomposed leaves from the woods, one-fourth stable manure, half rotted, and the remaining fourth, leached ashes, to be prepared in a heap, and suffered to remain to mellow three or four months, to be turned up and mixed two or three times in the course of the process, or with any well rotted manure. If after the young trees should be set out, a long continued drought should occur, they should be watered two or three times a week.

VARIETIES OF THE WHITE MULBERRY.

The White Mulberry is a tree not known by its fruit. Two varieties bear white berries, one red, and another black, and trees have been known to bear different kinds of fruit on the same tree.

METHOD OF SAVING SEED.

As the fruit ripens, the tree should be shaken every morning, and the fruit that falls gathered with that which may have fallen off itself. Put the fruit into a tub and press it and rub it till the berries are completely worked into a common mass. They should then be washed in water until the pulp is completely separated from the seed. During the process of washing, the water must be repeatedly changed, and in pouring off the dirty water, the seed which swims must be suffered to escape, as it is not good. When the seed is thus perfectly cleansed and separated, it must be spread on cloths in the shade to dry. When *perfectly dry*, it should be put up in bottles, well corked, which should be kept where they would never be exposed to *light*, *air*, or *dampness*. The White Mulberry seed are of an obtuse triangular shape, and of a dull, dark yellow color, and very full of oil.

MODE OF TESTING SEED.

Soak it in *hot* water a few hours, when the seed which is really good will *sink* to the bottom, the worthless will continue to float on the surface; the latter must be thrown away as it will not vegetate.

PREPARATION OF SEED BEDS—TIME OF SOWING, &c.

1. To sow an ounce of seed, prepare a bed 50 feet long and 4 feet broad. Manure it *well* with a compost composed of one-third stable manure, one-third ashes, and one-third decomposed leaves from the woods, or garden mould;* dig *deep*, pulverize finely, and then lay the bed off in drills 12 inches apart, $\frac{1}{4}$ or $\frac{1}{2}$ of an inch deep; sow the seed as thick as you would that of onions, or parsnips; cover with rich mould, press the mould down gently, but sufficiently to cause the seed to come into contact with the earth; and should the weather be dry, water the seed bed every other evening, it will assist in promoting the germination of the seed and the vigorous growth of the plants.

2. The *best time for sowing the seed* is from the 1st of April to the beginning of May; and, indeed, in favorable situations, if sown as late as the beginning of June, they would succeed; but if sown in the spring, the earlier the better, as the plant will thereby have time to grow to such a size, and the bark become as well hardened, as to offer something like a guaranty to their getting over the first winter, which is decidedly the most critical period with the young plants. If you should determine upon sowing in the spring, turn up your plant-bed deeply the preceding autumn, and let it remain in a raw state, to derive advantage from the fertilizing effects of the winter's frosts, manure in the spring, dig it again, pulverize and rake fine, lay off as above directed in drills, and sow your seed.

Should it not be convenient to sow in the early part of the season, you may do so with perfect security in the *first week of August;* your bed to be thoroughly prepared, by being well manured, turned over with a spade two or three times, and *pulverized and raked well.* Whether sown in the spring, or summer, the bed must be kept clean of weeds, the ground to be stirred occasionally between the drills, receive a watering of a weak solution of soot and water, diluted barn-yard water, or soap suds once a week, or fortnight; and, in dry weather, twice a week in addition with water, it being important to push the growth of the young plants the first season. The watering should not be carried on after August. By pursuing this nourishing and forcing course, you may urge your plants so far forward as to be able to transplant the *stronger* ones into nursery beds the ensu-

* Any well rotted manure will answer.

ing spring after sowing the seed. The *fruit* of the White Mulberry when ripe, if put in the ground whole, in drills, will vegetate immediately, and if the plants be kept *weeded*, and treated as directed above, will be sufficiently advanced to stand the winter with the aid of a slight covering. The first fruit of this tree ripens about June.

The seed should be soaked forty-eight hours in a *solution of soot and hot water* before sowing, drained through a sieve, rolled in plaster and then sowed. An ounce will yield from 5,000 to 8,000 plants.

The first winter the plant-beds must be covered with long stable manure, leaves or straw, to be confined with small twigs of pine or evergreen. Matting will also answer as a covering. This should be put on as soon as the black frosts come, and kept on until the middle of the ensuing April; to be then *removed cautiously*, so as not to expose the plants too suddenly to the injurious effects of the bleak winds, or frosts of the spring. In covering the plants, care must be taken not to smother them.

3. The second year, if not removed before, the plants must be removed into the nursery rows or beds, which must be prepared as for any other crop. The ragged roots being taken off and the tap-root shortened, the plants must be planted out 12 inches apart in rows 3 feet apart, the earth to be well trodden around the plant. As before, the earth must be kept open and free from weeds, and be watered, as directed, in dry seasons. If, however, the plants are thrifty, they may be permitted to remain in the seed-bed until planted out in hedges: if intended for standard trees, it is indispensable to remove them to a nursery, where they may attain larger growth than they could otherwise attain in the seed-bed.

4. It may be laid down as a general rule, that the plants when a foot and a half high are fit to be transplanted into the nursery. They should be taken up with great care, without injuring the roots, and divided into classes, planting those of a size together. In transplanting them, their roots should be a little shortened, and all tender fibres, which may have been injured by the frosts should be cut off.

5. At two years old, the plants may be planted out into hedges, at 18 inches apart, in rows 8 feet wide. The ground should be prepared as before directed, and some good rich mould put into the holes, to be pressed around the plants. If intended to be planted out as standard trees, 20 feet square apart would be a good distance; but in that case, the plants should not be transplanted until they are about an inch in diameter. In either case they will require trimming and topping, and if kept as hedges should be treated as other hedges are.

6. In every instance before planting in hedges, or standard trees, the ground should previously have had the benefit of a meliorating crop, as potatoes, carrots, parsnips, &c. so that the soil may have been put into the best possible condition for their reception, and in setting them out, the holes or hedge rows in which they may be placed, should have the advantage of a good rich compost, such as we have prescribed for the seed-beds.

7. *Standard trees* should not be placed out permanently until they have attained a height of 7 or 8 feet.

8. Whether the Morus Alba or Morus Multicaulis be planted, we believe that the *hedge* form will be found to be the most advantageous as well as convenient mode; the same given quantity of land will produce at least 80 per cent. more leaves planted in *hedges*, than in *standard trees;* the *labor* of gathering leaves is fully one-half less, and the vegetation is much quicker; and these, it will be admitted, are considerations of primary moment; besides these advantages, the trimming which the hedges will annually undergo, will necessarily impart a more acceptable and delicate quality to their foliage.

A few *standard trees* should be kept on every estate, and particularly where

situated in the interior, for the purpose of keeping up regular supplies of seed, and of making that of leaves doubly secure; plants destined for standard trees should always be selected from among the handsomest and straightest plants.

MANAGEMENT OF STANDARD TREES.

When the plants are grown to the size of one inch in diameter, and from 7 to 8 feet high, they are fit to be planted out in the field where they are permanently to remain; make the holes sufficiently large to admit the roots without difficulty or crowding. The roots should be trimmed, then press the earth around them as it is filled in the hole. The transplantation may either be done in the *spring* as soon as the frost is out of the ground, or in *autumn* just after the fall of the leaf. The latter period is preferred by Mr. Smith, in order to let "the small fibrous roots which convey nourishment to the tree have time to prepare for their functions by the vegetating season the next spring." In planting out standard trees, leave all the buds which the young trees have pushed out on the top, till the following spring, when none are to be left but three or four branches to form the head of the tree—these should be so left as to form a circle round the stem, and that the interior of the tree may be kept open, all buds as they appear on its body should be pinched off for a few years. For several years, the head of the young tree should be thinned out, cutting off such branches as cross others, or take the lead of the rest; thus equilibrium in growth, and beauty in appearance, will be effected. Every spring the young trees should be dressed two or three feet around the trunk; and stakes should also be placed by each at the time of planting to ensure straightness, and prevent the ill consequences of being too much agitated by the wind in the early period of their growth.

MANAGEMENT OF HEDGES, &c.

Make your rows, as before directed, 8 feet wide apart, plant the young trees 18 inches apart, taking care that the two lowest buds be in the direction of the *line*, (which should be drawn *straight*,) the plant to be cut down to these two buds about half a foot above the ground; by the ensuing spring these buds will have become two beautiful branches, when one of them is to be pruned down to one foot, and always on one side of the plant; the branches of the opposite side to be left untouched, but to be bent in the direction of the hedge towards the lopped branches, and fastened to them with willow withs so as to form an arch.—The third spring the plants will have branches to form a hedge, when they must be cut about two feet from the ground, leaving the branches below that point untouched and entire. When plants die, replace them by layers from an adjoining one, as the introduction of new plants hardly ever succeed. The hedge should never be permitted to grow higher than six feet, so as to keep it within a convenient height for gathering the leaves. After the leaves have been gathered, the hedge should be pruned, and particularly of such branches as may have been injured or killed, as also each spring, in the beginning of April, dead branches must be pruned from the living wood with sharp hedge shears, and it should be endeavored at these prunings to give form to the hedge.

OF THE MORUS MULTICAULIS.

What we have said above concerning the transplantation of the mulberry, has relation to the *Morus Alba* species, and we now propose to give some brief directions with relation to the space to be occupied by the Morus Multicaulis, both in the *hedge* and *standard tree* form.

If in *hedges*, they should be planted 3 feet apart in the row, the rows to be 6 feet asunder. If as *standard trees*, they should be planted in rows 8 feet wide, the plants 8 feet apart in the row.

This species of the mulberry partakes more of the character of the shrub than of that of the tree, and, therefore, require less room when planted as standard trees, and more in hedge, in consequence of its propensity to throw up branches

from the roots. With the difference as to distance above described, the treatment of this tree must be the same as the Italian Mulberry.

Having the subject of the Morus Multicaulis again before us, we feel it due alike to ourself, to the public, and to Gideon B. Smith, Esq., to state, that in a recent conversation with that gentleman, he gave it as his opinion, that any one desiring to enter into the silk culture as a business, must abandon every idea of cultivating any other kind than this, as from its superior fitness, in every respect, to the feeding of the worms, it would be impossible that any one growing any other kind could compete with those who fed with it; that as there are no offal from coarse fibres, fully one-third of the labor of gathering will be saved, there being in the other mulberry leaves fully that amount of coarse matter which is not consumed by the worms. He says further, that the leaves of the Morus Multicaulis yield a finer silk, more delicate in texture and brilliant in gloss than any other kind. Than the opinion of Mr. Smith, none better need be required, on a matter where he has experience to form that opinion upon, and, therefore, we should always be cautious in differing on such points with him; but when we look at the brilliant results of the Italian culturists and manufacturers, we are half tempted to believe that the *Morus Alba* makes *good-enough silk*, though in economy of *labor* the *Morus Multicaulis* is incomparably the superior of all others; and our own opinion is, that instead of *one-third* of the labor being saved, fully ninety per cent. may be economised in the expense of feeding; as, in addition to the advantage arising from the absence of offal, the superior *size* of the *leaves* of the Morus Multicaulis reduces the expense of gathering and feeding to a vast amount.

DISTANCE OF HEDGE ROWS.

With respect to the distance between the hedge rows, we are aware that some are of the opinion that they should be sufficiently wide to admit a cart to pass through while the leaves are being gathered; we object to it for these reasons, first, because the pressure from the horse and cart would so beat down the intervening spaces as to have an injurious effect upon the vegetation of the trees, and secondly, because the hedge rows would be liable to be injured by the horse and cart. We think it better that the leaves should be gathered in large baskets, to be conveyed therein to the cart, which should be conveniently stationed for that purpose; or light hand-carts to be propelled by men, might be substituted to decided advantage.

OF MODES OF MULTIPLYING.

The means of propagating the *White Italian Mulberry* are various, viz:—*from seed, which is the best*, as previously described; by *grafting* and *budding*; from *layers*, *cuttings* and *suckers*.

GRAFTING.

It may be done on the stocks in the nursery, or on the small limbs of trees. *The proper season for it is just before the leaves begin to open in spring.* The head of the stock must be cut off sloping, and a slit made sloping the opposite way, deep enough to receive the scion, which should be cut like a wedge, with the outside thicker than the inner. The rind of the scion must exactly join the rind of the stock. The slit should be opened by a wedge of hard wood; the scion should then be gently put in its place and the stock closed. After this the whole must be daubed round with a mortar made of a mixture of loam and fresh horse-dung, so as completely to exclude the access of air; and this mortar must be surrounded by tow or old cloths to prevent it from being washed away. The scion should be covered nearly to the top with this mortar, and it should also extend two or three inches downwards round the stock. In place of the mortar, Forsyth recommends a plaister made of pitch, turpentine and beeswax.

BUDDING.

Provide yourself with a sharp knife, with *a flat thin haft*, and some bass-matting, or corn-husk strings; let these be soaked and in readiness. Then select a smooth part of the stock as high as you intend budding: and make a horizontal cut across the stock as deep as the firm wood, and then from the centre of it make an incision downwards about an inch; then take the haft of your knife, and raise the skin on either side of the incision. Then take your knife and cut your bud, which is done in this way: take your knife, place it about half an inch below the bud, cut slightly into the pith or wood, so as to go below the heart of the bud; cut upwards to the same distance beyond the bud, then cut the bud out, trim off the leaves, insert your bud by raising the rind and shoving it down so as to close both sides of the skin on it, joining it closely to the upper edge or horizontal cut. Then take your bass, or corn-husk string, and bind it close around every part, except over the eye or bud, which is to be carefully left out and preserved, and continue it a little above the horizontal cut, not binding it too tight, but sufficiently so to keep the parts close, *exclude the air, sun and wet;* finish by making the ligature fast. At the expiration of a month loosen the bandages. In the March following, the heads of all those which have taken, must be cut off just above the part where the part was inserted.

LAYERS.

Having dug the ground well and made it light, take some of the most flexible and free growing *shoots*, *slit the shoot* underneath a joint or bud, up the middle, and about an inch long, or a little better, according to the size and nature of the layer, forming a sort of tongue, laying the part in the earth and raising the top upright, so as thereby to separate the tongue of the slit from the other part and keep it open; peg the shoot down with a two pronged stick, leaving about six inches out of the ground, in an erect position, then cover up with a rich mould, pressing down the earth. The shoots should be layed down in *July* and *August*, and may be taken up or cut off the ensuing autumn or following spring, when they should be planted out.

CUTTINGS.

Cuttings should be taken off with a sharp knife from the shoots of the previous summer's growth. They should be from six to fifteen inches in length, and should, in all cases where practicable, have a portion of the old wood attached to the end to be put in the ground. Let them be planted in a nursery bed, *well manured*, in rows eighteen inches apart, the cuttings nine inches asunder. They should be taken from the tree between the falling of the leaf in the fall and swelling of the bud in the spring. In planting, they must be placed two-thirds their own length in the ground, great care being taken to press the ground well around them. In dry weather they must be watered well, say twice a week, be always kept clean of weeds, and have the earth stirred two or three times in the course of the summer and spring. The cuttings when taken from the tree should be wrapped up in a matting, or put away in dry sand in a dark cellar, and kept until the opening of spring, when they should be planted out, in somewhat a slanting position. If attended to and forced by occasional waterings with suds or the drainings of dung, they will be fit to transplant the second spring thereafter, either in hedges or orchards.

SUCKERS.

These should be separated from the parent plant early in the spring, each with some roots; if of sufficient size, they may immediately be placed in their permanent position; if not, let them be put into a nursery bed two feet apart, where they are to remain until their size indicates the propriety of the removal. They must in either case be treated as seedlings or cuttings with respect to being kept clean and watered.

MODES OF MULTIPLYING THE MORUS MULTICAULIS.

The question has been mooted and discussed whether this tree does or does not *bear fruit*, and consequently *yield seed*. Some affirming and others denying that it does. So far as the public interest is concerned, we believe that it is altogether unimportant on which side the controversy may be settled, as we hold that if it were ever so prolific of seed, a just economy would dictate that the multiplication of this species should be by *roots*, *layers* and *cuttings*. Why should the culturist, whose interest requires that he should receive a prompt return for his outlay, await the slow process of propagating from *seed* when he can embrace the more sure and rapid one above suggested? We do *know* that the *Morus Multicaulis* yields fruit and seed, but both in small quantities; but if those quantities were ever so great, it would be best to use the *wood*, as the *tree* thus propagated reaches a greater hight in *one season* than it would from the seed in *five years*. If we were asked why the plant from the *seed* grows slower than that from the *bud*, our reply would be, that it is in accordance with the laws of nature that it should do so; and we would go farther—nature has most wisely ordained that wherever she has provided a plant with but few seed, she has conferred upon it the power of multiplication by means of its branches, thus making amends in the one way for its lack of liberality in the other.

With these brief remarks on this head, we will proceed to describe the modes by which this *species* of the mulberry may be propagated.

By Trees.—If the culturist proposes to go at once into the silk business, and to plant out his orchard to feed from, having prepared his ground and fixed upon the distance of his rows and that of his plants, all he has to do is to strike out deep furrows, place his trees therein at the proper distances, and while one person holds up the tree in its place, let the other shove the earth around the roots, which must be compressed by the first, so as to give the shrub a firm set in the earth; this done, the labor will have been performed. Two inches is a good depth to cover the roots.

By Layers.—If you propose to layer your trees, you may either do it by layering the whole tree, or you may deprive it of its lateral branches, and layer each separately; the latter plan we would recommend as being decidedly the best, as there is not room for the trees to expand and grow when placed so closely together. We shall, therefore, deseribe the mode of layering where the lateral branches are taken off.

Prepare your ground with neatness, and pulverize it thoroughly by ploughing, harrowing, and rolling. When so prepared strike out your furrows of the prescribed distance, north and south, manure in the drill with good rotten barnyard dung, the composts we have before spoken of, or slaked ashes; then take your root with the main stem attached to it, lay it down in the furrow, and cover it over about two inches deep. It is possible that the furrow will not be deep enough to admit of your covering the root that depth; should that be the case, take your hoe and deepen a place for the roots. As you cover the root and main stem press down the earth lightly with the flat part of your hoe, so as to make the soil adhere to both. In covering be careful to draw into the furrow none but the well pulverized mould, so that the leaflet may meet with no obstruction in its ascent to the surface. A little care in this particular at the time of planting, will save much vexation afterwards and prevent loss.

The roots and main stem being thus planted, proceed then to lay down your *lateral branches* in the same way, and cover as we have directed for the former. In laying down both divisions of the tree, you should place each about two feet apart in the rows, to admit the free circulation of sun and air between the trees, as the influence of these agents is necessary to ripen the wood.

By Cuttings.—After an experience of some years, we are free to confess that

this is our favorite plan of propagating the Morus Multicaulis. The trees thus grown are decidedly better, and for the very simple, though all-sufficient reason, that having more room they have a better chance of growing.

There are three ways of propagating by cuttings; two in open culture, the one by placing the cutting down flat or horizontally in the furrow, the other by giving it a vertical position, at about an angle of forty-five degrees, inclining to the north, the bud facing the south—the last by starting the plants in hot-beds.

If the cuttings should be planted in open culture, two buds we maintain should be used; if in *hot-beds*, one bud is sufficient.

In Open Culture.—It will strike the reflecting reader that if the cuttings are placed in open culture, that it is peculiarly proper that the ground be thoroughly prepared and pulverized, and that it is equally important that it be in good heart, as the delicate bud will, when thus situated, require active nutriment to give it impetus and sustain it in its upward movement to the surface, as also to preserve it in a vigorous condition after it shall have reached that goal. We repeat, then, unhesitatingly, that you cannot be too careful in preparing, pulverizing, and manuring your ground. If you have plenty of well rotted barn-yard or other stable manure, deal as liberally with your mulberry patch as you would with a brag lot of corn, and put it on *broadcast;* if your supply is scanty, you may apply your manure in the *list* in which you are going to place your cutting, which should have two beds.

After your ground is manured, ploughed, rolled, and harrowed, (if you manure *broadcast*) strike off your furrows north and south, then *list* from east to west *two feet*, or *one*, as you may see fit—the former is the best distance—place your cutting in the *list*, or hole, give it an inclination to the north of about forty-five degrees, the upper bud facing the south, draw the earth around the cutting with your hand, so as to cover the upper bud about the eighth of an inch, and with the finger and thumb press it tightly around it.

If you design planting them flat, place one of the buds upwards, draw the earth over the cutting about an inch, and press it lightly with the bottom of your hoe as you would a hill of corn.

Our experience teaches us to prefer the former plan, and we therefore, recommend it as the *safest*. It does, to be sure, require more time; but then when one is putting in a crop of great value, a little extra labor should not be regarded as of consideration.

If the ground be not manured *broadcast*, the manure should be placed in the list or hole in which the *cutting* is put; and care should be taken to draw a little of the pulverized soil over the manure.

If the culturist has not a supply of well rotted manure, a hundred and fifty bushels of ashes, mixed with four loads of mould from the woods will do, or the same quantity of scrapings from lanes or roads will answer.

Care must be taken as the cutting comes up that it be not choked with grass or weeds, and at this early step, the safest plan will be to *hand-weed* until the plant reaches a height when it may be safe to use the *hoe*. To prevent the growth of weeds and grass between the *rows*, the *plough* or *cultivator* must be used. We, however, prefer the latter; which, if used at the *proper time*, will be found a most efficient implement; and we would here recommend that it be freely used whenever the grass and weeds make their appearance, and that the *culturist* sedulously avoid letting them get ahead, as one week's delay over the proper time for working, may increase his labor a hundred per cent., besides injure his growing mulberries. It is our purpose to emphatically impress upon his mind the absolute necessity of keeping the plants clean and the ground well stirred and mellow. Let him continue his culture up to the beginning of August, when he should give his trees a thorough working, and then leave them to ripen their wood. Be-

yond that period, we would not continue their culture, as every stirring of the ground serves to encourage the growth of *new wood*, and consequently to retard the ripening of that which has already been made, two things which should be avoided at this period.

If it were practicable to water the cuttings before they have gotten above ground, in case of a *drought*, it would be of great service to them; but as the labor is great, this attention cannot be expected where the patch is large. If, however, the thing be practicable, they may be watered two or three times a week, and always in the afternoon about sun-down. On this head we have a remark to make: if you begin watering, you *must continue* it until rain comes to render it unnecessary, as it is better not to attempt it at all, than to begin and not carry it through the season of drought. When once out of the ground, the drought must be of long duration, indeed, if it injure the plants.

When the plants begin to form their leaves, strew over them, while the dew is on, plaister of paris, in the proportion of a bushel to the acre.

TIME OF PUTTING IN CUTTINGS.

The time of planting your cuttings in open culture is when the frost is out of the ground and the earth sufficiently warmed by the spring's sun to start vegetation. As a general rule you may safely confide them to the earth whenever it is time to plant corn; and, indeed the same attention that is necessary to ensure a good crop of corn, will secure you a good one of Mulberries.

We have thus far given directions with respect to the treatment of cuttings in *open culture*, and will now turn to our more favorite plan of starting the plants in *hot-beds*.

CULTURE IN HOT-BEDS.

We are aware that the most of our readers know how to prepare *hot-beds;* but as there may be some who do not, and as we propose to describe a very simple process by which to make them, the manner of forming them may not be unimportant.

Let a frame of common boards be formed of the desired length, and 4 feet wide, about a foot and a half deep in front, and two and a half feet in the rear; the ends to be planked up, and stayed by a post in each corner; at convenient intervals let cross pieces or slips be placed so as to afford resting places for the matting to be used as a covering. When your frame is made, place it on the surface of the ground where you allot it to remain. Then take as much fresh stable manure as will make a bed in your frame about 8 or 9 inches deep; put this up into a heap, and let it remain for eight or ten days to let the more fiery particles escape; then spread it evenly on the bottom of the earth within your frame, and as you *fork it* in press it down with that instrument. Let it remain thus about three days, when you must cover the dung with a *light dry mould or compost*, to the depth of about 5 inches; your bed will then have been made.

Having prepared your bed, you must get your *cuttings* ready, which must be done in this way: Separate each cutting with one *bud* or *eye* to it. Then take a sharp knife and cut a slice of the lower end of the cutting off about three-fourths of an inch below the bud, on two sides, somewhat in the shape of the bowl of a pen; that done, stick your cutting in the mould of the hot-bed about an inch apart, inclining the top of the cuttings to the north, at an inclination of about forty-five degrees, the *buds* facing the south: as you place them in the bed press the earth around them with your finger and thumb, taking care to *cover* over the bud about the fourth of an inch. It has been customary with some to leave the tip of the bud out of the earth, but our experience convinces us it is best to slightly cover it, as the plants come up more vigorously, and maintain their growth better.

We do not believe it necessary to use glass coverings for the frames, unless the cuttings be put in *earlier* than is necessary. Our plan is to provide ourself

with straw or grass matting, sufficiently large to cover the frames. These mattings we put on every evening before sun down, and keep them on till the sun gets considerable power in the morning, when we take them off and let them remain so until near sun-down, unless the sun should prove very hot, and the air drying; in which case we place them on. To prevent the escape of the heat of the bed from the sides, let a few inches of horse dung be placed around them.

In cold or rainy weather the matting should be kept on.

Two or three times a week, just before putting on the matting for the evening, let the bed be gently watered with a watering pot; the water to be exposed to the sun for at least a day, previous to being used.

When your plants come up and begin to expand their leaves, sprinkle a little plaister of paris over them.

When they attain the size of *cabbage plants fit to be planted out*, they are large enough to be transplanted. Then get your ground ready as before directed, and strike off your furrows and lists. This being done, take up your plants with a trowel or piece of shingle or board, carefully, so as to let as much earth as possible adhere to the roots, take them to your field and plant them out one in each of the lists or holes made by the plough; draw the earth around them with your hand, press it with your finger and thumb, and if your planting is just after a *rain*, as it should be, you may rest assured that ninety-nine out of a hundred will grow off well, and most of them without any falling of the leaf. The great art in succeeding in this way, consists in not permitting the plants to remain too long in the hot-beds, as from their nearness, if permitted so to remain, they are apt to grow up spindly. When once planted out, all you have to do to ensure their thrifty growth, is to keep them clean and the ground loose around them.

The *time* of putting the cuttings in the *hot-beds* without glasses, is from about the tenth to the twentieth of March in this latitude, provided the weather be favorable.

The advantages resulting from starting the cuttings in hot-beds are these: 1. It enables you to put them in much earlier, and thereby ensure to your trees at least four weeks longer growing season: 2. You save half the expense of the outlay for cuttings, as *one bud* answers instead of *two*, which is necessary in open culture: 3. There is a much greater certainty of the cutting taking when planted in a hot-bed, than when in open culture: and 4. From the small space of ground occupied by the hot-beds, watering the plants is at all times practicable, which advantages we hold more than counterbalance any saving of labor effected by the other mode of culture. But there is another advantage, which is of importance. Your plants being transplanted when your ground has been just freshly prepared, get a start of the weeds and grass, grow off vigorously, and are almost out of harm's way before these pests re-appear.

If hot-beds with glasses were used, the cuttings might be put in much earlier; but we maintain that no advantage would be gained, whereas a *loss* might be, as the plants would inevitably take on a spindly habit before they could be set out in open culture, and moreover they would be less hardy.

EARLY SUPPLY OF LEAVES.

In order to provide against every possible casualty from frosts, and to secure an early supply of leaves for the worms on their first hatching, the culturist should place a hedge in some warm situation, say a southern exposure, well protected from the northern and western winds, and in the spring, early, they should have a covering of platted straw or matting to protect them from the frost at night. As the worms in their first feeding consume but little, this hedge might be located on a garden border, and as it would only be used for a few days, it would during the rest of the season form a very pretty ornament to the garden: seed might also be sown broadcast or in drills, in a forcing border, or hot bed, to

be in readiness to meet the first calls of the worms for food. There are also other resources to which the agriculturist might resort for the early feeding of his worms, when their hatching may anticipate the leaf of the Mulberry. Lettuce, Dandelion, the White Raspberry, the Oyster plant, and the dry leaves of the mulberry, of the preceding year, reduced to powder, moistened lightly with water, have all been found to answer the purpose of temporary feeding; but the use of either should only be adopted in the event of the hatching of the worms before the appearance of the Mulberry leaves, which should be sedulously guarded against, by carefully keeping the eggs in such temperature and location as will delay the coming forth of the worms until there is a regular supply of food to sustain them.

DIVISION HEDGES.

Where ground is an object, the White Mulberry might be made to perform the place of division fences; if planted along the fences and wattled in with the rails, in a few years they would form not only a very beautiful but a *permanent living fence*, as when they once fairly take root, it is impossible to eradicate them, even with the aid of the grubbing hoe and the pick axe; for trees which had been cut down upwards of twenty years have been known to throw up young shoots every spring, thus manifesting a tenacity for life, which render them invaluable as live-fences. It has been ascertained that if the Mulberry be protected from cattle for two or three years, all future protection will be unnecessary, as the biting off the young twigs in spring by cattle, is rather a service than a disservice. Hedges intended for the joint purpose of fences and food, should be trimmed as before prescribed, and be kept at about 6 feet high.

PRUNING.

It is said by some that a judicious pruning of *standard* Mulberry trees should take place every three or four years; but we incline to the belief, that to render it proper, at any time, the necessity for removing unnecessary limbs or branches must exist, and of this, the culturist must necessarily be left to judge for himself. In the spring, say about the beginning of April, all dead branches or limbs ought to be removed from the living wood, care being observed to let the taking off the branch or limb, be done with a sharp instrument, so as to leave a smooth surface, which should be smeared over with a mixture of three-fourths fresh cow dung and one fourth chalk, moistened to a proper consistence.

It may be assumed, in addition to the pruning above recommended, that always after the gathering of the leaves of the season shall have been done with, all the branches that may have been damaged in the operation, and all the dead ones, ought to be lopped off, as well as those the vegetation of which seems too low; and those the vegetation of which on the contrary is too luxuriant, ought to be restrained in that propensity, or trained in oblique direction, which is a means of restraining a too rapid growth: they ought not to be left to grow to an excessive height, nor to spread too far. The branches which obstruct the development of the head, or hang too much down, should be shortened; and lastly, those that have been thrust out of their natural direction, during the gathering of the leaves, ought to be set right again. As a general remark it may be safe to add, that they should be treated in the main as fruit trees are.

GENERAL REMARK AS TO THE MODE OF MULTIPLYING.

We have given succinct directions with respect to the various methods by which the Mulberry may be propagated; but, as a general rule, we should prefer the growing of the White Italian Mulberry from seed to any other form, and in this opinion, we are backed by the experience of that eminent Italian culturist, Count *Dandolo*. He says:

"The leaf of the [seedling] tree, contains the proportion of both the nutritive and silky substances. I have, says he, ascertained the following facts:

1. That 14¼ lbs. of wild Mulberry leaves, will produce a pound and a half of cocoons; while 20¾ lbs. of the leaves of the grafted Mulberry, are required to yield the same quantity.

2. That 7½ lbs. of cocoons, proceeding from silk worms fed on leaves of Wild Mulberry give about 14 oz. of very fine silk; whilst generally the same weight of silk worms, fed with the leaves of the grafted Mulberry, only yield eleven or twelve ounces of silk.

3. That the silk worms fed on the wild leaves, are always brisker and have better appetites.

The result is, that, taking two trees of equal age and vigor, the grafted tree yields 50 lbs. of leaves, and the wild tree only 30 lbs.; the weight of nutritious substance will be nearly equal in each."

To this authority may be added that of *M. Martleroy*, an experienced culturist in France, who found that the silk worms fed with the leaves of the *seedling* Mulberry tree, were more healthy, vigorous, and less subject to diseases, than those which are fed upon the leaves of the grafted trees.

The term "wild trees" as used by Count *Dandolo*, must be understood, in every instance, to mean trees raised from the seed, being used in contradistinction to those propagated by the other appliances of the trade, used in the propagation of valuable plants, and in addition to these reasons, we believe the seedling will be found to be more thrifty, luxuriant in foliage, and longer lived.

Indeed, with such facilities as are possessed in our country for multiplying the Mulberry tree from seed, no inducement exists to a resort to any of the numerous other methods of propagation.

AS TO THE TIME OF SOWING SEED.

In our variable climate, it is almost impossible to fix any thing like a *day* for the sowing of seed in the spring; for it is out of the question, to calculate with any degree of certainty, upon any considerable number of successive days of congenial temperature. Under such circumstances, all we can do, is, to prescribe general rules of government; and in the furtherance of our views, we should say—that the seed should be sown as early in the spring as the *ground and weather will permit.* Say, in winters and springs of ordinary mildness—in the more *southern states* about the 1*st of April*—in the western, from the 15th of *April* to the 1st *June*—in the *middle states* from the 1st of of *April* to the 1st *May*, in forward springs—in backward springs, from the 15th of *April* to the 15th of *May*, and in the *northern* and *eastern states*, from the 1st of *May*, forward during that month, as may be indicated by the weather.

AS TO SOIL.

It may not be inopportune here to make a few general remarks upon the subject of *soil.* Although the young trees for the first year or two, would be evidently improved in their growth by being placed in rich dry loamy soil, yet all experience proves that the plant after it shall have attained a few years of age, grows luxuriantly in every kind of soil. Mr. Smith has seen the tree in every variety of soil, from the poorest to the richest, and has been able to observe no other difference in its foliage than a more firm texture in that which grew on poor land, than in that reared on rich; and it is uniformly admitted that a *dry, sandy loam, sandy, light gravelly*, or *stoney soils* of like texture, are preferable for the growth of the mulberry, and by all means we would advise that they be put in good condition, as every thing grows best when well fed. After the trees have a good thrifty growth, manuring will not be necessary, as *silk raised from poor ground is decidedly best.*

Here a remark presents itself to our mind, which we feel bound in duty to make. It is known to every intelligent man, that in each county of most of the old states, there are thousands and tens of thousands of acres of worn-out lands,

which are either grown over with scrubby oaks, or pines, or covered with that emblem of a heart broken soil, the sedge-grass. Such lands,—barren and worthless as they may seem in the eye of one who has been used to looking at fields dressed in their brightest and most luxuriant array of verdure,—may all be converted into sources of wealth, by being formed into Mulberry plantations or orchards, by simply manuring the young plants in the drill, in case of hedges, or in the holes in the event of standard trees, with rich compost or loam, or even by manuring with half-rotten stable or barn yard manure; and it should be recollected, that when once started in this way, the young mulberry will require scarcely any thing further from the hands of the cultivator, but to keep it clean and watered, as may be seen in our remarks under the preceding heads. All the subsequent manuring, whether they be planted in hedges, or in standard trees, which they will require, will more than repay him by their yield for all the labor he may put upon them. A crop of potatoes, occasionally, well manured between the rows, followed by clover, which can be cut one year and ploughed in the next, will be all that will be necessary to secure to the trees, permanent, vigorous growth, and plentiful produce of foliage.

AS TO MODE OF CULTIVATION.

As we have before remarked, we prefer the *hedge form*, and would keep no more standard trees than might be necessary to secure supplies of seed to meet contingencies.

PERIOD WHEN LEAVES MAY BE FED.

The white Italian mulberry trees should not be deprived of their leaves until the *fourth* year, and then they should not be entirely stripped; on the following year, however, and the succeeding ones, they may be treated as old trees, and all the leaves be taken off when required for the food of worms; an acre in the hedge form, would, we believe, furnish sufficient foliage, after the fourth year, to support the number of worms requisite to produce the quantity of silk, which forms the basis of the calculations to be found under the proper head, with respect to the product from the Morus Alba. It is best, however, not to be too anxious in pulling them before the plant has received some solidity, and been placed in a situation to withstand any violent demand upon its powers of production, as by judicious attention for a year or two, and a proper consulting of the demands of nature, the tree will receive such an impetus as will ensure to it a long life and luxuriant foliage.

Some of the culturists in the eastern states, are of opinion that leaves may be gathered at two years old, provided those near the end of the branches are left and the main stem be not touched. Our opinion is that such practice is contrary to nature, and cannot be justified upon any principles, connected with reason or a just economy of vegetable life. "Leaves," it has been very happily said, "bear the same relation to trees and plants, as the lungs to the bodies of men and animals. A leafless tree dies soon; and, therefore, that not more than half of its leaves, or at most two-thirds of them should be stripped."

The Morus Multicaulis tree can be fed from the *first* year to a profitable extent, and improves in the quantity of its foliage every subsequent one for nine or ten. This is an advantage which must place it at the head of every other species or variety of the Mulberry family. Indeed we look upon its introduction into our country as one of the most important events in its history, and as being calculated to add millions to the value of its productive industry.

YIELD OF FOLIAGE—PROFIT OF THE CULTURE, &c.

It is impossible to ascertain with any thing like accuracy, the quantity of leaves which an acre of Mulberry trees will yield; but still we can approximate sufficiently near to found a calculation upon it. We will here array some of the various authorities upon this branch of the subject.

1. It is stated in the *Memoir* submitted by Mr. *Bailiff Houtt*, of Manheim, to the *Agricultural Society of the Grand Duchy of Baden*, that a White Mulberry tree, 20 years old, planted in a proper soil, produces on an average, two quintals of foliage, (200 lbs.) and that seven quintals, 700 lbs., are required for 40 lbs. of cocoons.

2. It is computed by Mr. D'Homergue that each tree (standard) at 6 years of age, will yield 30 lbs. of leaves, which he proposes should be set at 6 feet square apart, properly cultivated and nurtured.

3. The *Editor* of the Manual, assumes the following, it being the best result at which his mind could arrive, after the most careful examination of various authorities—that is, that a tree, as a standard, four years of age, well cultivated, will yield 20 lbs. of foliage, that at 6 years of age it will yield 30 lbs., and that if planted in *hedge-form*, an acre of land will yield an amount of leaves when six years of age more than equal to the support of 540,000 worms, that is, he believes that each tree at 4 years, will yield 4 lbs. of leaves, and at 6 years will yield 7 lbs. of leaves, and that its capacity to yield will increase by the time the hedge shall have attained its twentieth year, 100 per cent, that is, that the acre will, after the expiration of that period, yield a foliage competent to the sustenance of upwards of a million of worms, and this will not be doubted, when it is considered that the acre in hedge form, six feet wide apart and $1\frac{1}{2}$ asunder in the rows, will contain 4,840 plants—as 6 x $1\frac{1}{2}$ is equal to the square of 9, and that being divided into 43,560, the number of square feet in an acre, gives 4,840, as:

9) 43,560 (4,840. No. plants on an acre 6 feet by $1\frac{1}{2}$.

Mr. *Frost*, of Massachusetts, fed 1,500 worms on 75 lbs. of leaves, which precisely corresponds with the average food as laid down by Count *Von Hazzi*, of Munich. He says: On an average *twenty thousand* worms require, in the 1st period, 5 lbs. of leaves; 2d do. 15 lbs.; 3d do. 46; 4th do. 139; 5th do. 795 lbs.—total, 1000 lbs. And he observes, further, that "until lately, twice as much would have been consumed in Germany, in consequence of the errors which attended the rearing of worms, their feeding, the economy of the leaves," &c.

Count Dandolo estimates that about 37 lbs. 12 oz. will feed 1000 worms, but we take the larger number, as we wish to make a liberal allowance for wastage and other contingencies.

4. Mr. *Fitch*, speaks of a full grown tree, which yielded food for worms, which *made four pounds of silk*, and as 3,000 is the *general average* for a pound of silk, there must have been 12,000 fed on this one tree.

Mr. Fitch also states, that an acre of full grown trees, set one and a half rods apart, will produce 40 lbs. of silk.

5. Mr. Tufts confirms this calculation, but does not state the distance at which the trees stood from one another.

6. Mr. Storrs says, that a full grown tree will feed 6,000 worms, which will produce one and a half pounds of silk. An acre of trees will produce 60 lbs. of raw silk in one season.

7. Mr. *Smith* states, that a full grown tree will feed 5,000 worms.

8. Mr. *R. Falley*, now of Ohio, had 18 lbs. of silk from about 100 trees, *part of which were young*, in Massachusetts.

9. It is stated in the Columbian Magazine, that in the year 1789, nearly four pounds were produced from 7 trees, and 1 lb. from 8 trees 8 years old, from the seed.

10. According to Count Dandolo, it is a certain fact, that, if silk worms are well managed, 21 lbs. of mulberry leaves will be sufficient to obtain a pound and a half of cocoons, and that in Dalmatia he obtained a pound and a half of cocoons from 15 lbs. of leaves, which yielded a pound and a half of silk, and he further affirms that $97\frac{1}{2}$ lbs. of leaves will produce $7\frac{1}{2}$ lbs. of cocoons. For the

yield of the trees we take Bailiff Houtt's estimate, 200 lbs. of leaves to the full grown tree.

11. Miss *Rhodes* could scarcely suppor ten thousand worms on the leaves of twelve large trees in England.

12. According to *Lambruschini*, 100 lbs. of clear leaves will feed worms which will produce 6 lbs. of silk.

13. Mr. *Genet*, the former French Minister to this country, in his *Memoirs* on the subject of silk, states, that "a *small hedge* that will occupy the twentieth part of an acre, being planted with bushes not more than three years old will supply and accommodate 100,000 worms, the produce of which will be 30 pounds of raw drawn silk, and if the whole acre is planted in the same way, the produce will be six hundred pounds, which if merely spun into sewing silk, would amount at the present price of American sewing silk at Albany, [then] three dollars per pound, to $1,800.

14. Mr. *Daniel Bradly*, of Marcellus, New York, estimates that an acre of ground will yield foliage enough for a million of worms, and that some go so far as to say that it will support two million.

15. On the authority of the Hamilton County (Ohio) Agricultural Society, as we have before stated, it is affirmed that four young ladies in Massachusetts, gathered as many leaves off of four acres in 1833, as fed worms which made them 420 lbs. of silk, besides attending to the domestic concerns of the household.

16. The late Mr. *Parmentier*, of New York, a distinguished Nursery-man and Horticulturist, stated that an acre of mulberry trees, when full grown, would yield foliage enough to feed worms that would produce 490 dollars worth of silk.

REMARKS UPON THE PRECEDING.

We have prepared in a succeeding page, a table, shewing the produce per acre, according to the respective statements and data of the several persons given under the preceding head, and in order that the reader may understand the principles upon which our several calculations are made, we will briefly explain each, as they respectively stand in numerical order.

No. 1. Mr. *Houtt* states that a tree twenty years old will yield 200 lbs. of foliage, and we calculate, as 108 trees, 20 feet square apart, can stand on an acre of ground, the acre will yield 21,600 lbs. of leaves. Again he says, 700 lbs. of leaves will produce 40 lbs. of cocoons, and, therefore, 21,600 lbs. will produce 1234 lbs.; then, as 9 lbs. of cocoons are equal to 1 lb. of silk, so is 1234 lbs. equal to 137 lbs.

No. 2. This is calculated upon the same principle as the first branch of the above, with this difference, that the 6 feet square assumed by Mr. D'Homergue, will give 1210 trees to the acre—the square of 6 being 36, that divided into 43,560, the number of square feet contained therein, gives 1210 as the quotient.

No. 3. *Our own* calculation is based on a similar principle.

No. 4. Mr. *Fitch's* statements do not accord with each other, and we have, therefore, undertaken to reconcile their discrepancies. In the first place, he speaks of having seen a *full grown* tree that afforded food for worms, which made 4 lbs. of silk: then he tells us that an acre of *full grown* trees set a rood and a half apart, will produce 40 lbs. of silk. Now as a rood and a half is 24 feet, 75 trees can be set upon an acre, and unless Mr. Fitch has *two measures* for his *full grown* trees, he is not consistent with himself, as, 75 such full grown ones as he first describes, would yield 300 lbs. of silk, instead of 40. The first tree he names must have fed 12,000 worms; but if we calculate that his subsequent ones are competent to feed 5,000, the most generally received number, the 75 must have produced 125 lbs. of silk. It struck us however as most fair to take the *average* of the three, and we accordingly made our calculations upon that data.

No. 5. Mr. Tufts having avouched Mr. Fitch's statement, we have made the same calculations for him.

No. 6. Mr. Storrs estimates that it will take 4,000 worms to make a pound of silk; this is much too high; 2,400, 2,542, 2,700 and 3,000 have severally done so; but he has even set the produce of an acre at greatly below what his extravagant estimate would make it. We believe we make a liberal allowance for contingencies, when we assume 3,000 as the number competent to give a pound of silk; we have, therefore, found our average, by calculating the pound at that ratio; at Mr. Storrs' 4,000, and then at his 60 lbs. per acre.

No. 7. We take Mr. Smith's estimate of the capacity of a full grown tree, and Mr. Bradley's for the measure of that of the worms, and thus arrive at the result in the table.

No. 8. We take this as we find it, though it is evidently made with too much looseness to entitle it to the least consideration, and but that we wish to show both sides of the picture, we would not give it.

No. 9. Here too there is much looseness; but to prevent cavil have placed the trees 20 feet square apart, and thus find a result much below what the data would justify.

No. 10. Count Dandolo gives data for three calculations, and as his great experience in the business, enlightened mind, and mathematical exactitude in all that he does, entitle his statements to every consideration, we have made caculations for each and taken the average, viz: 171, 184 and 240—595 aggregate—average, 198⅓, and we are pleased to find that this is 17⅓ lbs. more than our own; for from the familiarity of this distinguished gentleman with the business, the utmost reliance may be placed on his estimates; because they are the result of actual practice.

No. 11. Miss Rhodes' experiments being made in England, where the worms will *not labor*, should not be taken into the account; for England has long since abandoned the culture, having given it up as utterly impracticable owing to the humidity of the climate;—but as our object is truth, we give it for what it is worth.

No. 12. This is a high-pressure calculation, which never has been, and, in our opinion, never *can be realized:* we are, therefore, disposed to think that, in the *translation*, the word "*silk*" has been substituted for that of "*cocoons*"—with this changed version, it would approach much nearer practicable results.

No. 13. This author is also too high, in our opinion, though he has several good authorities to back his calculations withal.

No. 14. This a little to sanguine also.

No. 15. This being an actual result, is of course, to be taken for its actual amount, and although less than an acre is capable of producing by nearly a hundred per cent. it is a most wonderful product, all things considered.

No. 16. This, in our opinion, is much below what can be realized from an acre properly cultivated.

RECAPITULATION.

A TABLE, shewing the probable produce per acre, according to the estimates and data furnished by the 16 different persons enumerated therein, made upon the principles as explained in the preceding remarks:

No. as per list above.	*Names of the parties.*	*Estimated No. of pounds of Silk.*	*Value of Silk per pound.*	*Amounts.*
1	Mr. Bailiff Houtt,	137	$4	$548
2	Mr. D'Homergue,	242	4	968
3	The Editor,	180	4	720
4	Mr. Fitch,	155	4	620
5	Mr. Tufts,	155	4	620
6	Mr. Storrs,	146	4	584
7	Mr. Smith, as explained,	180	4	720
8	Mr. Falley,	18	4	72
9	Columbian Magazine,	61	4	244
10	Count Dandolo, aver.	198	4	792
11	Miss Rhodes,	27	4	108
12	M. Lambruschina,	1296	4	5184
13	Mr. Genet,	666	4	2664
14	Mr. Bradley,	333	4	1332
15	4 Massachusetts' ladies,	105	4	420
16	Mr. Parmentier,			490
	Totals,	3989		16,086
	Total of all the estimates,			$16,084
	Average product per acre,			$1,005

We now propose to make a few calculations, in order that the reader may more fully comprehend the table just given, and those which may follow.

It is computed by Mr. D'Homergue, that a tree 6 years old, will yield 30 lbs. of foliage, and that they may be planted 6 feet square apart, which would give us 1,210 trees on an acre, there being 43,560 square feet in an acre, as

Square of 6, 6 × 6 = 36) 43560 (1210 No. of trees on an acre at 6 ft. square [apart

36

75
72

36
36

Thus, then, if there be 1210 trees on an acre, yielding 30 lbs. of leaves to the tree, they will give foliage enough to support 726,000 worms, and as 3000 cocoons will yield a pound of silk, so will the gross number give 243 lbs., as per examples:

1210 trees on an acre,
30 lbs. foliage to each tree,

36,300 lbs. of leaves on an acre.

It has been proved by the actual experiments of several silk culturists, indeed, we might say, by *universal* experience, that 50 lbs. of leaves will support 1000 worms during the feeding season.

The question may be therefore thus stated: If 50 lbs. of leaves feed 1000 worms, how many worms will 36,300 lbs. of leaves feed.

If 50—1000—36,300
1000

5,0) 36,30000,0

726,000 worms.

Again, if 3000 cocoons make a pound of silk, how many pounds will 726,000 make. If 3000—1—726,000
1

3,000) 726,000

Amount raised on an acre according to Mr. D'Homergue's statement, 242 lbs. of silk.
4$ per lb. present selling price

Gross value of an acre in silk culture, $968

We have no doubt, ourself, that this amount might be realized, and even more, from an acre in the silk culture, properly attended to, in the hedge-form, but as we do not wish to excite over sanguine expectations, *we* have assumed *data* even less than that justified by the actual experiments, or rather practical business results, of Count *Dandolo*, one of the most intelligent among the Italian silk culturists. The following examples will show the amount produced by that gentleman, according to his statement, as per No. 10 in the table.

There being 108 trees on an acre, each bearing 200 lbs. of leaves, the whole will yield 21,600 lbs. of foliage, as

108 No. of trees on an acre
200 No. of pounds per each tree

21,600 lbs. the produce of an acre.

As Count Dandolo says, that 21 lbs. of leaves will yield $1\frac{1}{2}$ lbs. cocoons, so will 21,600 lbs. of leaves give 171 lbs. of cocoons; as

If 21——$1\frac{1}{2}$——21,600
2 3

3 21) 64800

2) 3085

1542 lbs. of cocoons.

As 9 lbs. of cocoons give 1 lb. of silk, so will 1542 lbs of cocoons yield 171 lbs. of silk; as If 9—1—1542
1

9) 1542

171 lbs. of silk.

Again—Count Dandolo has obtained $1\frac{1}{2}$ lbs. of cocoons from 15 lbs. of leaves: this will give us the following as the product of an acre's culture:

If 15——$1\frac{1}{2}$——21,600
2 3

3 15) 64800

2) 4320

9)2160

240

And again—he says, that 97½ lbs. of leaves will produce 7½ lbs of cocoons—this gives us the following result:

97½	7½	21600
2	2	2
195	15	43200
		15
		216000
		43200
		195)648000
		2)3323
		9) 1661
		184 lbs. of silk

Product of the several results.

171
240
184
3)595

Average product of an acre according to Count Dandolo, 198 lbs. of silk @ $4 per lb— $792.

Our own calculation is predicated upon the statement of Mr. Smith, that a full grown tree will yield foliage enough for 5,000 worms, and as 108 trees at 20 feet square apart will stand on an acre, so will that number of trees support 540,000 worms, and as 3000 will make a pound of silk, so will 540,000 make 180 lbs., as per example:

108 No. of trees on an acre,
5000 No. worms that one full grown tree will support,
3,000)540,000

180 lbs. silk raised from an acre,
4

$720 the gross value of an acre.

We will now state an account current, by which the nett profit of an acre will be clearly demonstrated, and we beg leave to make this explanation, that with a view of providing against all possible contingencies, we have taxed 540,000 worms with the expense of the *labor* of 1,000,000, which will more than cover all drawbacks arising from mortality among the worms, or any other unforeseen casualties.

Dr. 1 *Acre in Silk Culture, in account with A. B.* *Cr.*

Interest on 1 acre land, valued at $20 at 6 per ct.	$1	20	By 180 lbs of silk at $4 per lb.	$720 00
Interest on laboratory, valued at $500 at 6 per ct.	30	00		
Hire of 2 men 5 weeks at $6 per month each,	15	00		
Their board at $1½ per week,	15	00		
Hire of 2 women 4 weeks, at $3 per month,	6	00		
Their board at $1½ per week,	12	00		
Hire of 4 women 3 weeks at $3 per week,	9	00		
Their board at $1½ per week,	18	00		
Hire of 12 children from 7 to 14 years old, 2 weeks at $1 per week,	24	00		
Their board at $1 per week,	24	00		$720 00
Balance as per contra,	$565	80		
	$720	00	By balance or clear profit on 1 acre in the Silk culture,	$565 80

Having thus demonstrated the practicability of realizing $565 80 cents, from one acre in the silk culture, well attended to, on which, however, an excess of labor equal to 46 per cent. or the cost of the labor necessary for 1,000,000 of worms is charged upon 540,000 worms, we will now prepare a *table*, shewing the nett profits on from 1 to 10 acres, the same excess of labor being charged, the object of which, is, to cover any contingent demands which may be made upon the product of the worms, whether by mortality or otherwise:

A TABLE, *shewing the nett profit of the Silk culture from* 1 *to* 10 *acres, both inclusive, as demonstrated by actual results, the expense of labor, however, being charged as aforesaid in the ratio of* 46 *per cent in excess.*

	Product of 1 acre.	Product of 2 acres.	Product of 3 acres.	Product of 4 acres.	Product of 5 acres.	Product of 6 acres.	Product of 7 acres.	Product of 8 acres.	Product of 9 acres.	Product of 10 acres.
Gross product, $	720 00	1440 00	2160 00	2880 00	3600	4320 00	5040 00	5760 00	6480 00	7200
Cost of culture,	154 20	308 40	462 60	616 80	771	925 20	1079 40	1233 60	1387 80	1542
Nett profit,	565 80	1131 60	1697 40	2263 20	2829	3394 80	3960 60	4526 40	5092 20	5658

We will now, for the better satisfaction of the reader who may desire to be thoroughly informed with respect to *actual* profits, without the trouble of reducing the data given to calculation, prepare a table showing the exact profit upon 1, 5 and 10 acres in the Mulberry culture, according to the data furnished by Mr. D'Homergue, that of Count *Dandolo*, and *ourself*, the *actual* cost of labor being charged.

A TABLE, *shewing the actual profits of the Mulberry culture upon* 1, 5 and 10 *acres, according to the estimates of Mr. D'Homergue, Count Dandolo, and the Author of this Manual.*

	Calculation according to Mr. *D'Homergue's* data.			Calculation according to Count *Dandolo's* estimate.			Estimate of the author of this Manual.		
	1 acre.	5 acres.	10 acres	1 acre.	5 acres.	10 acres.	1 acre.	5 acres.	10 acres.
Gross product, $	972 00	4860 00	9712 00	792 00	3960 00	7920	720 00	3600 00	7200 00
Cost of culture,	111 94	559 70	1119 40	85 10	425 50	851	83 26	416 30	832 60
Nett profit,	3 60 26	400 3-0	7592 60	707 90	3534 50	7069	636 74	3183 70	6367 40

As we desire to be fully understood upon this important branch of the subject, we will enter somewhat more at large upon it. We ask leave then, in the first instance, to remind the reader that we have assumed the ability of an acre of ground in Mulberry trees, 6 years old, to sustain 540,000 worms. This number is *arbitrary*, it may be said, and so it is, as also is that of the yield of single trees; but they are both in our estimation low. We believe that if a *standard* tree, 20 years old, will yield 200 lbs. of foliage, it is a moderate calculation to say that one in the hedge row at 4 years old will give 4 lb., and that at 6 it will yield 7 lb. Mr. D'Homergue estimates that a *standard* tree of the same age will yield 30 lbs. and when we claim less than *one-fifth* for it in the hedge, we think we must be thought moderate.

The acre as we have before shown, in the *hedge-form*, will contain 4840 trees, which when 4 years old, at 4 lbs. of leaves to each, will produce 19,360 lbs. of leaves, and feed 387,200 worms, as 50 lbs. will support 1000 during the feeding season.

4,840
4

19,360
1000

5,0) 1936000,0

387,200 worms.

At 6 years old, according to our assumption, the following will be the result:

4,840 trees on an acre of hedge,
7 lbs. of foliage per each,

33,880 lbs. of foliage upon an acre,
1000

5,0) 33,88000,0

677,600
540,000 No. of assumed by us.

137.600 excess over our calculation.

It would thus appear evident, that if the trees at 6 years old should yield the quantity of leaves assumed by us, an acre of land will afford foliage enough to support 137,600, or *one-fourth* more worms than we have claimed for it, which would, as 3000 give a pound of silk, make a difference in favor of an acre in silk culture, over our preceding estimate, of upwards of 45 lbs. of silk, or at the rate of $4 per lb., of $180.

It may be said, that all calculations which fix the number of pounds of foliage to be produced by a Mulberry tree, must necessarily be uncertain, and equally so is the assumption that a tree will yield food for any given number of worms. But then in both of these forms we must be governed by the experience of such culturists as reliance may be placed upon. Count *De Hazzi* says, that "it is now exactly known, from long experience, what quantity of food the worms require in their several ages, until they have begun to spin their silk. Twenty thousand worms correspond to one ounce of eggs of our weight, and they require through all their ages a thousand pounds of leaves." From 18 to 20 good Mulberry trees give, each, one quintal and a half of leaves, and consequently, from 8 to 10 trees are necessary for twenty thousand worms. From the concurrent testimony of almost all the writers, from 37 to 50 lbs. of leaves is consumed during the feeding season by a thousand worms, and having taken the largest average, we feel certain that we cannot at all events be considered as exaggerating profits.

SUPPOSED PRODUCT OF THE MORUS MULTICAULIS.

Our preceding calculations have been predicated upon what we believe to be the probable yield of an acre planted in the *Morus Alba*, or *White Italian Mulberry*, and as the product of foliage of the Morus Multicaulis is much greater, we propose to show in the subjoined calculation, what we as firmly believe may be realized from an acre planted in the latter species of Mulberry. And in order that we may be distinctly understood, we will precede our estimate with a few prefatory observations. We design that the acre shall be planted in the *hedge form*, say the rows 8 feet asunder and trees $1\frac{1}{2}$ feet apart. As there are 43,560 square feet in an acre, and 12 is the square of 8 by $1\frac{1}{2}$, so will an acre, thus planted, contain 3,630 trees; and we assume, that *each* of these trees, at three years of age, if properly cultivated, and not despoiled of their limbs, will yield 15 lbs.

of foliage, annually, which gives as the aggregate, 54,450 lbs. of leaves from the acre; and it is but fair to infer, that in the fourth year, if trees at *three* years old will give 15 lbs. of leaves, that at *four* years, they will each yield 16 lbs., which will furnish us with the acreable aggregate of foliage, of 58,080 lbs. If these *data* be correct, and we think the yield is not beyond the competency of an acre of the *Morus Multicaulis*, then we may arrive at something like an approximation to practical results, if any thing based on human opinion can be so considered.

The experience of Europe, as well as that of America, go to prove, that 1000 worms have been subsisted, *during the entire feeding season*, upon from 37 to 50 lbs. of leaves; now let us take the largest amount, in order that we may the more safely rely upon the result of our calculation. Then, as 50 lbs. of leaves will feed 1000 worms, so will the *acreable* product before named, 58,080 lbs., sustain 1,160,000 worms. This is the result which our figures bring us to; but as it is always best to be on the safe side, and to depress rather than exaggerate, we will assume the position, that an acre is capable of supporting 1,000,000 worms. We will further remark that as 3000 cocoons make one pound, so will 1,000,000 make 333⅓ lbs. of silk. Having thus laid down our *premises*, the reader will be able to judge for himself, whether the *conclusions* at which we arrive in our *estimate*, be correct or not. At all events, we hold them to be sufficiently so to base upon them what we give as an *approximation* to an acreable product.

Dr. *One acre in account with the culturist.* *Cr.*

Interest on 1 acre of land, valued at $20 at 6 per cent.	$1	20	By product of one acre of silk, converted into raw silk, say		
Manure for do.	20	00	333⅓ lbs. at $4 per lb.	1,333	33⅓
Ploughing and harrowing,	5	00			
Wages of one woman for 6 weeks at $3 per month,	4	50			
Board for do. at $2 per week,	12	00			
Wages of one woman for 5 weeks at $3 per month,	3	75			
Board for do. at $2 per week,	10	00			
Wages of 5 children from 7 to 10 years of age, for 4 weeks, at $1 per week each,	20	00			
Board of do. 4 weeks at $1½ per week, each,	30	00			
Expense of reeling Silk, say,	50	00			
Interest on cost of cocoonery, say	48	00			
Balance as per contra,	$1,128	48⅓		$1,333	33⅓
	$1,333	33⅓	By nett profit as per contra,	$1,128	48⅓

The reader will perceive, that we have not set down any thing as expense for interest on the purchase of trees, and for the following reasons: *First*, because from the smallness of the outlay necessary, it is scarcely an object, as owing to the facility of propagating the *Morus Multicaulis* from cuttings, but few trees would be required to make a *commencement;* and *secondly*, because the sales from the trees to be multiplied would largely overbalance such outlay.

We have charged the services of one woman for *six* weeks, and another for *five*, and our reasons for so doing are these: We believe that, for the *first* of the *six*

feeding weeks, *one woman* will be sufficient to attend to the designated number of worms; that *two* will be sufficient for the second week, and that from that period *five* children, in addition, will be sufficient.

The reader will have observed that we have only taxed the interest on the cocoonery at $48; we have put it at this limited amount, because we know that on most estates where a million of worms would be fed, there are already a sufficiency of out-buildings, as *barns*, *cotton-houses*, and *tobacco-houses*, for the accommodation of that number of worms; so that, in fact, the only expense would be for coarse shelving and fixtures, which could be covered by the *principal* of the interest charged.

We have set nothing down as the wages of a Superintendent, because we are certain that every silk culturist *should be* his *own* superintendent, and we feel equally certain, that in a business so interesting as that of the silk culture, he would take pleasure in being so.

We have put down 3,000 cocoons as being required to make a pound of silk; this we consider a larger number than is always required, one-sixth less having made that quantity.

In our calculation, we have only credited the acre with *one crop* of silk, whereas if the *eggs* be *kept over*, and they may be by being placed in an ice-house, to prevent their hatching, two crops may be fed from the ordinary worm. There is also a variety that is, from its habits, called the two crop worm. We do not intend this remark to be construed as that we are in favor of *second crops;* for though, under certain circumstances, they can be made the same season, we by no means deem it advisable, believing that the time of the culturist could be much more advantageously employed, in converting the raw silk made in his *first* feeding into *sewing silks* and *twists*, and that such conversion of it is no less *practicable* than *profitable*. We think we could, with one of old friend Adam Brooks' machines, cause any ordinarily intelligent woman, in one day, to be taught to make as good sewings as one-half of the imported articles.

We are aware that many persons will deem the attempt fallacious to establish a probable acreable product, in a business so novel to most people in this country as is that of *silk making;* but when we draw most of our facts from actual results in Europe as well as here, and give the items on which our calculation is predicated, it is perfectly competent for every reader to detect our errors if we have made any. In our own opinion, there is not an item in the whole statement, wherein a mistake is likely to have occurred, except in the one in which the product of *foliage* is named. And although we do not think our estimate too large in that particular, if it should prove an *error*, we shall hold it as a *venial* one in a country like our's, where there are so many worn-out fields adapted to the culture, which can be had for a very small consideration. But when we turn our eyes to the recent experiment of the Rev. *D. V. McLean*, alluded to in our introduction, we consider that we are fully sustained in the premises. It will be remembered, that he fed on the *sixteenth* of an acre in Morus Multicaulis, a sufficient number of worms to make 31 lbs. 14 oz. of cocoons, and that had he been able to procure eggs, he believes that he could have fed worms enough to make upwards of 60 lbs. of cocoons from the same mulberries. For argument sake, we will take the 60 pounds as his *maximum* limit, and they would give us 960 pounds of cocoons to an acre, or upwards one hundred pounds of raw silk, as 9 lbs. of *good* cocoons will make a pound of silk. These trees, let it be remembered by the reader, are from *roots only one year old.* If then an acre of year old trees, will produce upwards of a hundred pounds of silk, we ask the reader, whether our estimate, that 4 year old ones will produce in a triplicate ratio, is unreasonable. Concede to us that point, and we are relieved from the only existing difficulty in our estimate.

We wish the reader to bear in mind, that our estimate is formed upon the supposition, that the whole of the million of worms live through the feeding season, and *make cocoons;* now as it is not reasonable to suppose that any such good luck should fall to the lot of any one, a proper deduction is to be made for contingencies. Suppose then by way of argument, that we admit that *casualties*, of one kind or another, sweep off one-fourth of the worms, and that instead of our getting a million of cocoons, we should only get 750,000—and this is a heavy deduction if proper care in feeding, ventillation and cleansing be observed—the clear profits would then be $846.36 and a fraction. Nay, let us presume that *one-half* the worms die; that instead of getting the million of cocoons, we only obtain 500,000, still there would be left of clear profit, a fraction over $564.24—and surely such a result—such a profit—should satisfy the thirstings after gain of any mind, however avaricious it may be. Reduce our estimate 50 per cent., and still the silk culture must be admitted to be the most lucrative employment known to man. But we are unwilling to admit that any *casualties* could occur, unless through negligence or the most culpable improvidence, to sink it so far below what we have made it. Diseases do at times attack the worms, and produce vast amount of mortality; but the most of them may be prevented, if the proper precautions be taken; for the most of them derive their origin from fetid apartments, which may be provided against. The remedy then, being *preventive*, they are within the control of the culturist, and if he should sustain loss, the fault is his own.

If the man who may plant a crop of corn, should fail to work it—should neglect to stir the ground and keep it open to atmospheric influence—should omit to extirpate the grass and weeds, and his crop should prove a sorry one, to his want of skill and slovenliness, his bad success would be ascribable; and to the same cause, ought a failure in a crop of worms be ascribed, should the culturist by neglect visit his worms with mortal disease.

TABLE OF DISTANCES.

A table showing the number of plants on an acre at certain distances, there being 43,560 square feet in an acre.

Feet	*feet*	*plants.*	*Feet*	*feet*	*plants.*
1½	by 6	4,840	12	by 12	302
1½	by 8	3,630	12	by 15	242
2	by 6	3,630	15	by 15	193
3	by 6	2,420	15	by 20	145
3	by 8	1,815	20	by 20	108
4	by 4	2,722	20	by 25	87
6	by 6	1,210	24	by 24	75
6	by 8	907	25	by 25	69
8	by 8	686	25	by 30	58
10	by 10	435	30	by 30	40
10	by 12	363	30	by 40	36

TABLE OF MEASURES.

14 oz. cocoons produce about 1 oz. eggs.
68 eggs weigh 1 grain.

1 oz. contains	22,640	eggs.*
5 ounces,	113,200	"
10 ounces,	226,400	"
15 ounces,	339,600	"
20 ounces,	452,800	"

* The general computation is that an ounce of eggs will hatch 20,000 worms.

40 ounces contain, 905,600 eggs.
80 ounces, 1,811,200 "
1000 worms consume 50 lbs. of leaves,†
9 lbs. of cocoons will make about 1 lb. of silk,
3000 cocoons make about 1 lb. of silk,‡
300 cocoons make about 1 lb. of cocoons.
A female moth will lay about 450 eggs.

MODE OF GATHERING LEAVES.

Count Dandolo states that much depends, in regard to a long preservation of Mulberry *trees* and *hedges*, on the method of gathering their leaves; that it should be done with great care, to prevent the trees from receiving injuries. That caution is so much the more necessary, as nature has not intended they should be stripped violently of their foliage. It is, as he says, essential that all the leaves should be pulled off; for if any remain on some branches, they attract the sap whilst the naked branches are incompletely nourished. The stripping of the leaves should not be begun before the disappearance of the dew, and ought to be concluded before the setting of the sun. The hand should move from below upwards, in order to avoid pulling off the buds.

All climbing upon trees must be avoided, and the best way to gather the leaves, it is suggested, would be to use a rolling ladder, which consists of two parts, a wheelbarrow, the legs of which are to be from seven to eight feet long, straight, somewhat projecting beyond the wheel, and connected by four cross sticks; and a ladder six feet long, which is attached to the wheelbarrow by a fourth cross stick; with this apparatus a single man is able to carry several bags of leaves. The end to the place on the ground must be pointed with iron. The bags used in this apparatus must be hooped, so as to remain open, and ought to have a hook to be hung on the branches, and care must be taken that the leaves be not emptied on the ground, it being particularly desirable to keep them clear of dust: when conveyed to the wheelbarrow they should be kept sheltered from the sun. Leaves covered with tough viscous matter,—the honey dew, as it is called,—are injurious to the worms; they must be used only in case of necessity, and not then until they are thoroughly washed and dried.

If the *hedge-form* be adopted, *as it should be*, all the trouble and expense of the rolling ladders, will be rendered wholly unnecessary. But even in that event, lightly constructed wheelbarrows, with deep beds, might very advantageously be substituted for the cart, as a means of transporting the leaves from the Mulberry groves to the laboratory.

SUPPLY OF LEAVES.

Care must always be taken to keep a good supply of leaves pulled and stored away in some cool place, and therefore it is particularly desirable to have a spacious airy cellar under the laboratory, where you may deposit three or four days supply of leaves, so as to be prepared against rainy-spells, as it *will not do to feed the worms with wet leaves*. A brick or stone pavement would be best.—Should it so turn out, from long continued rains, that your supply of dry leaves are exhausted, you *must dry* those which you may gather wet, before you attempt to feed the worms with them. This can be done by putting the leaves on clean cloths on the floor and turning them repeatedly, so as to let the water escape by evaporation and otherwise. But such an occurrence may be always avoided by a judicious exercise of judgment, and vigilant watching of the signs of the weather, by prudently having a supply in store. Dusty leaves must not be fed to the worms.

† Count Dandolo says 37 lbs. will answer.

‡ The precise number depends upon the quality of the cocoons—2,400, 2,500, 2,542, and 3,000, have respectively made a pound of silk.

TIME WHEN LEAVES ARE FIT FOR FEEDING.

It is important that the silk culturist should know when the leaves will be fit for feeding, in order that he may make the hatching of the eggs of his silk worms correspond therewith. We will, therefore, remark, that generally the leaves, of both the *Morus Multicaulis* and the *Morus Alba* would be sufficiently forward to be pulled in *Maryland* about the middle of May, to the *westward* a few days later, to the *eastward* two weeks later; *Virginia* (Eastern,) and the states further south, from fifteen to twenty-five days earlier.

THE LABORATORY OR COCOONERY, &c.

Having thus fully spoken of the Mulberry tree, and given all the necessary instructions relative to its culture, from the sowing of the seed, until the trees are sufficiently matured to justify the stripping of the foliage for feeding the worms, it would seem proper that we should say something about the construction of a *laboratory*, or *cocoonery*, for the accomodation of the worms, and of the necessary fixtures for conveniently carrying on their feeding, the preservation of their health, and the profitable employment of their very notable and interesting labors.

DESCRIPTION OF COUNT DANDOLO'S LABORATORY.

My laboratory, says Count Dandolo, is constructed to contain twenty ounces of the eggs of silk worms, or to accommodate 900,000 worms. It is 30 feet wide, 77 feet long, 12 feet high in the clear, and when reckoned to the top of the roof, 11 feet high. There are six rows of tables or wicker trays, about two feet six inches in width each, placed two and two, with four passages between them, each three feet wide. Posts are driven in between the trays, and strips of wood fastened to the posts horizontally, to support the trays, between which there is a space of five inches and a half to allow the air to pass freely.

There are 13 unglazed windows with venetian shutters, outside, and paper window frames inside; under each window, near the floor, are ventilators, or square apertures of about 13 inches, that they may be closed by a nearly filled sliding pannel, so as to permit the air to circulate and blow over the floor. When the air is not required, the paper frames may be closed. Venetian shutters may be opened or shut at will, [or substituted for the common pannel shutter.] When the air is still, and the temperature of the interior and exterior is nearly equal, all the window frames may be opened and the shutters must be closed.

There are eight ventilators in two lines in the floor and ceiling, placed perpendicularly, opposite to one another, in the centre of the passages between the hurdles or trays. They have sliding pannels made of thick glass to close them, and to admit light from above. As the air of the floor ventilators ascends, and that of the ceiling ventilators descends, it must pass through the trays. There are also six other ventilators, made in the floor, to communicate with the rooms beneath. Three of the thirteen windows are at the end of the house; and at the opposite end, are three doors, constructed so as to admit more or less air as may be necessary. These doors open into another hall, 36 feet long and 30 feet wide, which forms a continuation of the large laboratory, and contains trays sufficiently raised to facilitate the care of the worms. In this hall there are six windows and six ventilators in the ceiling. There are six fire-places in the great laboratory, one in each angle, and one on each side of the centre, and a large stove in the middle; glass oil burners, that give no smoke, are used to give light at night. Between the hall and the great laboratory, there is a small room having two large doors, the one communicating with the laboratory, the other with the hall. In the centre of the floor there is a large square opening, which communicates with the lower part of the building. This is closed with a wooden folding door; this aperture is used for throwing down the litter and rubbish of the laboratory, and for admitting Mulberry leaves, which can be drawn up by a hand pulley. Such is the construction of the laboratory of Count Dandolo.

In giving the above minute description of Count Dandolo's laboratory, we do not offer it as a *model* worthy of being adopted by culturists in the U. States. On the contrary, we think it especially to be avoided as an *example*, and for the simple reason that it is *too costly;* but notwithstanding, that we admonish against its adoption, we think valuable hints may be derived from it, inasmuch as it will enable those about to engage in the business to see the great principles to be aimed at in the construction of the establishment, to wit: "convenience, the preservation of a proper temperature, and the free circulation of air." These are the great cardinal points to which the American cultivator must attend, whatever may be the extent of the building he may construct.

Almost every large estate in the United States have buildings upon them which might at a trifling expense be converted into laboratories for the accommodation of the worms. Barns, cotton houses, tobacco houses, or other out-houses, may all be altered as to answer without at all interfering with their usefulness for the object for which they were originally built. All buildings may be said to be proper for receiving silk worms, which have one or more fire-places, two or more ventilators in the ceiling, on a level with the floor, and windows through which light may be admitted to the exclusion of sunshine.

And where no such buildings already exist, that can be spared for the purpose of the worms, one at a very moderate cost may be erected. Any one with ordinary enterprise and ingenuity may go into his woods and in a few days prepare posts, scantling and clap-boards in sufficient quantities to construct a house even upon the most extensive scale. As to the chimneys and shutters, they will answer every valuable purpose, no matter how plain, or how coarse, the materials of which they may be made.

In this country it is recommended that houses erected expressly for the purpose of raising silk worms, should be placed in the coolest places, and most airy situations attainable, and in the shade of trees, if possible, because it is always within our power to increase the heat of the apartment, when necessary, by means of stoves or fire-places, but it is not so easy to guard against a sudden increase of heat in the weather, which might go far to defeat the labors of the season, if it should occur in the fifth age, when the worms are nearly done eating, as will be seen hereafter.

We will now describe the apparatus of the Rev. Mr. Savagne, which is highly spoken of in the *transactions of the Society of Arts, London.* It is recommended on account of the small space occupied by it, the neatness in which it enables persons using it, to keep the apartment clean, and the ease with which the caterpillars can be fed and their litter removed.

Mr. Sevagne's Apparatus.—"The apparatus consists of a wooden frame, four feet two inches high, each side sixteen inches and a half wide, divided into eight partitions, by small pieces of wood, which form grooves, in which the slide run, and are thus easily thrust in or drawn out of the frame. The upper slide is of paper only, and designed to receive the worms as soon as hatched; the two next are of catgut, the threads about one-tenth of an inch distant from one another; these are for the insects, when a little advanced in size; the four lower ones are of a wicker work, the openings through which the dung is to fall, being about a quarter of an inch square. Under each of these as well as under those of catgut, are slides of paper, to prevent the dung of the cocoons falling on those feeding below."

"Mr. Sevagne afterwards found that netting may be substituted with advantage, in the room of wicker bottoms. The meshes of the netting were about half an inch square."

"The caterpillars are to be kept in the second and third drawers, until their dung and litter do not readily fall through, and then to be removed to the drawers

with wicker bottoms, and fed thereon, till they show symptoms of being about to spin. Each wicker drawer will afford sufficient room for five hundred worms, when grown to their full size."

In order to provide against a contingent increase of caterpillars, it will be always best to have a number of *spare drawers* ready for their accommodation.

"The feeding frames of the Messrs. Terhoeven, of Philadelphia county, are four feet square, and are fixed to upright posts; they have two sets in one room, with passages between and around them. This size enables a person to reach any point of them. Over the shelves, are frames or shelves placed on cleets, and filled with split rattans at proper distances to permit the litter to fall through."

It is obvious to us that all costly expenditures, either in the construction of a *laboratory* or in that of the *shelves* for feeding the worms on, are not only unnecessary, but would be a wanton waste of means and time. The great object of an American culturist should, and doubtless, will be, to make money—to study utility instead of ornament—profit instead of display,—in a word, the healthful accommodation and profitable employment of his worms. If these be his objects, they can all be attained for a very small comparative amount, and if they be not, he had better not engage in the business, but leave it to the possession of those who will enter into it with a view of benefitting themselves and their country.

To those who shall be thus influenced, there can be no difficulty either in providing a house or the necessary fixtures; for they may be both provided with the least possible expense; the plainer and more simple the better. The fact is, there is a mystery thrown around these matters, as there are around every thing else in European works, calculated, if not so intended, to create difficulties where none exist, and to give to very simple operations the air of complication. We will not say that these things are done with a view of repressing the spirit of competition—of preventing rivalry—for we have alike too much respect for ourself and charity for others, to believe in the existence of motives so unworty, unless upon the most indisputable authority; but the effect of the elementary treatises of European origin, upon this, and many other branches of industry, are so mixed up with unprofitable philosophical speculations, so embarrassed with impracticable theories, and the ostentatious display of learning, as to deter a plain common sense man from engaging in them. Whereas, when they come to be stripped of the verbiage, and to be divested of the fustian, with which they are decorated, they are very plain concerns—just such as an ordinary, enterprising, industrious farmer, might lay hold of, with decided advantage to himself, his family, and the nation at large.

Why need there be such parade about building a house for the worms to perform their labors in? In their native state, the forests of India were their dwellings, and the canopy of heaven their only cocoonery, or laboratory. There, there were no venetian shutters, no costly wicker or latticed work shelves, no hydrometers, and yet they lived on mid sunshine and rain and thunder and lightning. True they were then in their wild and native state—true also it is, experience has shown that since domesticated by man, and furnished with dwellings, they have yielded more and better silk; have suffered less from their natural enemies: but then, we maintain, the more simple and plain their accommodations are, the better. In proof of this, we would mention that in Italy, France, Bavaria, and other European countries, where the silk culture forms a material branch of husbandry, the hovel of the peasant, the barns, kitchens and all outbuildings of the opulent, are each converted into labor stories for the time being. And such also, is the fact in the New England states. There, those who have not the means of constructing cocooneries, as they there term the feeding houses of the worms, give them, during the short period of their labors, situations in

their dwellings, barns and every other place on their respective farms, calculated to afford room and shelter. In corroboration of what we have just said, we will quote from Mr. Cobb's excellent Manual, the observations which he makes upon this head. He says:

"European laboratories have been constructed with great care and expense; but however convenient these may be, they are by no means necessary to success in rearing silk worms; almost any building will answer for that purpose. I have reared them myself with success in a *barn*, in my *cellar*, *kitchen*, and other rooms of my dwelling-house, and in the *lower story of Tremont House*, in Boston."

It was found in France that the cocoons brought to market by the peasants, raised in hovels so full of cracks as easily to be seen through, and to admit the air freely, were richer and heavier than those raised in palaces and in the confined rooms of dwellings in cities.

We infer from all that we have seen and read upon the subject, that all to be aimed at in the erection of a laboratory, is, to put up a plain, cheap, substantial house, sufficiently large to accommodate the number of worms you contemplate feeding; to be provided with windows that will *admit* the *air* and *exclude* the *sun;* with fire-places or stoves, as may be most convenient, so that a proper temperature may be kept up at all times, and especially when it rains, as dampness exercises a pernicious influence over the worms, ingenerating a noxious effluvium, detrimental to their health.

Upon the subject of a laboratory or cocoonery, and the necessary fixtures, we shall further copy from the excellent essays of our intelligent townsman, *Gideon B. Smith*, Esquire, whose experience and observation entitle his opinions to every possible consideration.

Mr. Smith's plan—"The *fixtures* necessary for raising silk worms are, appropriate tables or shelves, in number and size corresponding with the number of worms to be fed. The best form for shelves that I have seen is that adopted by my friend, Mr. J. Y. Tompkins, of this city. It is about $2\frac{1}{2}$ feet wide by 5 or 6 feet long, made of thin boards, with a piece 2 inches wide nailed flat on the upper edge along the sides and ends, with legs about a foot long in the corners. The legs do not pass through the table, but leave a part of the hole on the upper side, for the feet of another table to set in. Thus contrived, five or six of these tables are set one above another, and are taken down, cleaned, and again set up with facility. One of these shelves will accommodate about 500 worms. If I could suggest any improvement in these shelves, it would be the substitution of twine net-work for the board of floors, with slides under them to catch the excrement of the worms.*

"The room or laboratory must, of course, be of a size proportionate to the number of worms raised, and should be provided with windows or ventilators on the north and south sides at least; and if one or two ventilators are opened in the ceiling it will be of great service. These ventilators, however, should have shutters that they may be closed at any time when necessary. Fire-places or stoves should also be provided for use when necessary. For the accommodation of one million of worms, a room about 80 feet long and 40 wide would be required. A large establishment would also require a ware-room for the deposite of leaves, and this should be large, so that in wet weather the leaves may be shaken and scattered about for drying. This room might be advantageously situated above the laboratory. A cool, dark cellar, will also be useful, for keeping the leaves fresh in dry weather—White Mulberry leaves will thus keep fresh for three days—the native mulberry will not keep so long."

*This hint has been improved upon by Mr. Whitmarsh, as the reader will see in reading the description of his "cocoonery."

NUMBER OF ATTENDANTS NECESSARY FOR A MILLION OF WORMS.

Mr. Smith says that,—"The number of attendants necessary for one million of worms will be *two* the *first* week, *four* the *second*, *eight* the *third*, and *sixteen* to twenty the remainder of the feeding season; one half of which may be boys and girls."*

In speaking of his fixtures, Mr. *Cobb* of Massachusetts says:

"I have used three tiers of rough pine boards fixed upon upright posts, about 4 feet in width, one above the other, with a space between of two and a half feet, affording sufficient room to pass all around the frame, so that I could conveniently reach any part of it."

The plan of Mr. *Cobb*, the reader will observe, is that pursued by Messrs. *Terhoeven*, of Philadelphia county, Pennsylvania, and does not differ at all from that recommended by Mr. Smith.

On the subject of a laboratory and its fixtures, we will give one other plan, which we copy from the Northampton Courier. It is that of Mr. Whitmarsh, which, as we have before remarked, is indebted to Mr. Smith, for, probably, the best of its arrangements; we allude to the lattice-work frames, which are identical with those of the Rev. Mr. Sevagne:

MR. WHITMARSH'S COCOONERY.

"Mr. Samuel Whitmarsh is erecting an edifice of two hundred feet in length, east of his house on Fort Hill, as a Silk House and Cocoonery.† The plan of it is original, and promises the best results. The worms while feeding, are now laid out upon boards and benches by those who rear them, covered with mulberry leaves, and when for health and cleanliness they are required to be moved, it must be done separately.

Mr. Whitmarsh's building is intersected by alleys, and on each side tiers of sliding frames or drawers rise from the floor upwards. These frames are covered with *lattice work of twine*. The top one is laid over with leaves upon which the worms feed. The second frame about an inch and a half below, is covered with strong paper or coarse cotton. The stems of the leaves or offal from the worms fall from the lattice work above, upon this drawer, and when the usual time for cleaning them comes, instead of lifting each separately, it is only requisite to remove the lower drawer and the cleaning is accomplished.

The leaf of the Chinese Mulberry, which Mr. W. will use, is so tender that the worm will devour it all. Sometimes they will fall from the lattice work above upon the paper drawer below. In that case, when a supply of leaves is laid on above, the worms at once ascend, as the distance is not too great between them, to prevent their reaching above. This is a great and important change introduced into the method of feeding and cleanliness, saving time and promoting the health of the worms.

Another improvement to be introduced by Mr. Whitmarsh, is the aid given the worms in winding their cocoons. Now, when the worms have terminated their feeding, easily known by their movements, branches of trees and bushes are laid over or suspended above them, and among which the process of winding is carried on. Consequently, they are much entangled in securing themselves, and lost to sight, and a great deal of labor and silk is lost, in the awkward method of separating the cocoons for use from the bushes.

He proposes, when the worms are ready to wind, to transfer them to upright frames, with twine lattice work, standing about an inch and half apart. The worms will reach over from one frame to another, fasten themselves at each ex-

*This has relation to worms fed on the White Mulberry; if they be fed on the *Morus Multicaulis*, upwards of 50 per cent. of the cost of laborers may be saved.

† It has been subsequently finished.

tremity, and then, in a small compass, envelope themselves in their cocoons. Every thing is then clean and compact, and after they have finished winding, the frames in pairs can be put away compactly, and, when wanted for use, the cocoons may be easily taken off. The building is well contrived for ventilation, and the reeling, by steam power, will be carried on in the same edifice. He intends to feed a million of worms this summer and reel four or five hundred pounds of silk."

We have been thus particular in developing the various plans of laboratories and fixtures, because it is the only part of the silk and Mulberry culture which can, in the least, be thought to bear the smallest resemblance to costliness, and the intelligent reader will find on a proper examination, that for a very few hundred dollars a house calculated to accommodate many millions of worms may be built, and that it is so simple in its construction as to be within the achievement of the mechanical skill of most plantation hands.

HATCHING THE WORMS.

The time of hatching the eggs is to be determined by the forwardness of the season, and should mainly be regulated by the state of the Mulberry leaves on which they are to be fed and supported; for it is a reckless waste of time and hazarding of prospective gain, to bring them into being before you are prepared to sustain their wants. All the authors we have consulted agree in this, that as soon as the leaves have developed themselves you may make your arragements for stimulating the worms into life. Upon this head Mr. Smith observes that:

"At the period for hatching, which in Maryland, is generally about the 1st of May, the eggs which are presumed to have been kept in the cellar, may be brought out and spread on paper on a common table, called the hatching table. The proper period is always best ascertained by the state of the Mulberry leaves. I consider the best and most safe time to be that when the leaves are about the size of a half dollar. The hatching table may be kept in the common laboratory. If the weather be mild and warm, the eggs will begin to hatch in eight or ten days. The first day or two there will but few leave the eggs. They need not be attended to. On the third a considerable quantity will hatch. Some fresh leaves should then be laid on them, when they will soon attach themselves to the leaves, and should be removed on to a shelf and be thinly spread out. The next day all that have hatched should be treated in the same way; and so on till they have all hatched, which will generally be in five or six days. Each day's hatching should be placed on separate shelves, and the whole laboratory arranged into as many divisions of shelves as there are days hatchings, that they may be continually kept separate. This is important, that the periods of moulting and spinning may be as nearly the same with all the worms on a shelf as possible.

In large establishments a small close room with a stove will be very useful in hatching the eggs, as the temperature may be regulated at pleasure. But in this case a thermometer is almost indispensable, as there would be danger of too high a degree of heat, which would spoil the eggs at this season, and the necessary equability and gradual increase of the temperature could not be secured without one. In this mode hatching by artificial heat, the worms will be brought out with more regularity and in less time than in the above described, and therefore it is preferable in large establishments. The hatching room should be, when the eggs are carried into it, of about 70° temperature, which should be increased one degree a day till the worms are hatched. The hatching room will therefore be of about 80° temperature when the worms are hatched, and if the laboratory is not then about the same temperature it should be raised to it, or nearly so, before carrying in the young worms, that they may not experience too great and sudden a change. The leaves may be torn in small pieces whilst the worms are small, and the worms should be fed during the first week two or three times a day, by scat-

tering the leaves over them. The second week the worms will require food three times a day, the third, fourth and fifth, it should be given them as fast as it is either consumed or becomes withered."

Having thus copied the plain common sense directions above, we would respectfully state that Count *Dandolo*,—and those who have either *abstracted* or *transcribed* his plan, for most all the writers appear to have done either the one or the other,—recommends that,

"When the Mulberry leaves are about to open, the cloths upon which the eggs are fastened, should be put into a small pail of water, steeped up and down, that they may be thoroughly soaked for nearly six minutes, which will be sufficient to dissolve the gummy substance by which the eggs are stuck to the cloth. The six minutes elapsed, the cloths must be taken out, and the water allowed to drip from them, by holding them up for two or three minutes. They should then be spread upon the table, the cloth to be well stretched, while the eggs are separated from the cloth with a scraper. The scraper should not be too sharp, for fear of cutting the eggs, neither too blunt, lest it should crush them." And after the eggs are off the linen cloths, they are to be put into a basin and submitted to the operation of another washing, and then drained either by means of a sieve or cloth, and dried, &c.

We have given this not with a view of recommending it, but merely of showing the parade that is thrown around a few eggs by giving a factitious importance to what does not deserve a second thought. Where we would ask did the worms in their native state procure their *scrapers* and persons to use them? Where did they derive the water to perform their ablutions in? Where, let us ask, has science derived the knowledge of the fact, that the gummy substance, which gives to the eggs their cohesive property, should be removed? We are not among those who would reject all improvements upon *nature*, but we confess we are of those who believe that all improvements tending to domesticate such interesting and ingenious *artistes* as the silk worms, should approach as near their mode of operation in their untamed condition as possible.

It may possibly be asked, as we have set our face against innovations, where in their native forests, did the silk worm obtain a thermometer? By what process did he regulate the temperature of the atmosphere? We answer that he did not obtain a thermometer any where; nor did he find means to regulate the temperature of the atmosphere. But those facts do not in the least militate against the soundness of our position, as from difference in the climate of that country and ours, what would be wholly superfluous there, would be absolutely requisite here.

There, the equality of the temperature of the atmosphere, renders such an instrument entirely unnecessary—here from the ever changing character of our climate, from hot to cold, from dry to humid, it is essentially necessary to the preservation of their health and the successful prosecution of their labors in all large establishments. The use of fire in stoves or fire-places are for the two fold purpose of maintaining a temperature ranging from 70 to 80 during the period of hatching the eggs, and from 65 to 70, afterwards, up to the completion of their toils, and to preserve the atmosphere *dry*. We do not pretend to affirm that worms cannot be successfully hatched, and raised without the aid of either stove, fire-place, or thermometer: on the contrary, we know that in the Eastern states they have been so raised, and are continued to be, by probably a majority of the farmers; but we think we are justified in the opinion that to ensure success, as we have before premised, to any *large establishment*, the culturist should be able to create an artificial temperature at all times, so as to counteract the deleterious influence of sudden atmospheric transitions, whether from heat to cold, or from aridity to dampness.

In maintaining this opinion we but consult nature, in the promotion of the health and comfort of this most ingenious insect, and consequently, ensure a vigorous prosecution of his labors. It is affirmed by every writer that a certain temperature is necessary to be preserved during the period of incubation, and if that be necessary, it can only be successfully done in *extensive laboratorics* by means of the instrument named. But there is also another important object to be gained. It is known, that, where large bodies are brought together in the same apartment, an atmosphere is generated, which if not corrected will prove detrimental to their healthful existence, and it is a fact equally well known, that there is no more efficient purifying agent than fire. The silk worm, when congregated together in large masses, make, comparatively, great deposites of noxious substances, which, no matter how much cleanliness may be observed, will become fetid and fill the apartment with vapors of an offensive and injurious character. It is also important to expel dampness whenever generated, and this can only be done by *heat;* but then, as the degree of heat must not be pushed beyond the prescribed point, an instrument is necessary to designate that *point*. In small establishments, the objects pointed out can be attained without the agency of any such instrument, as for instance, the farmer who appropriates but an acre or two to the culture, would be able to get along without it, making his feelings and judgment the criteria with respect to the temperature. In speaking of the necessity of preserving a dry atmosphere, we do not wish to be understood as pushing it to that point of rarification that would be offensive to a human being; *that* is to be equally avoided, and hence when inconvenience may arise from that cause, the introduction into the room of a few bowls of water, as is now practiced in ordinary stove rooms, will be proper to counteract it. We deem this explanation the more necessary as our aim is to unfold, as far as we can arrive at them, the difficulties as well as the advantages of the culture, to the American people. We shall, we trust, ever be found too tenacious of our own self-respect, and, to value the good opinion of our fellow men, too highly, to jeopard either the one or the other by making misrepresentations in this or any other branch of husbandry, which we believe could not be realized; nor will we through fear of deterring persons from entering into it, fail from making what we consider a candid and manly exposition of our honest and sincere convictions. Our objects is, not to get the agricultural community to adventure into this branch of husbandry with their eyes shut to its disadvantages —our desire is to lure them to its embrace by a candid and open statement of facts—we should scorn ourself, could we be influenced by other motives—could we be guilty of concealment. We believe that the culture is destined, if well prosecuted, to enrich those who may engage in it, and we feel it our duty to deal in all sincerity, truth, and fairness, in whatever we may advance upon the subject.

If the stoves be employed to produce the necessary temperature, it is thought that they should not be made of iron, because the heat cannot be regulated so accurately therein; but of thin bricks, soapstone, porcelain, or tiles. The stoves made at Bethlehem, Pennsylvania, of the latter material, or the porcelain ones which come from France, at a price of about $10, would answer well, and in order that the heat generated should be equable, the fuel should be either *tanners' drawn bark or charcoal.*

Count *Dandolo* prescribes that the eggs be hatched in a small, square, thick pasteboard, or thin board boxes or trays. For an ounce of eggs, a box or tray 8 inches square is required, and so in proportion for a greater amount, and these to be numbered. Besides these, he says, there should be wicker trays or boxes projecting horizontally from the wall for the boxes containing the eggs to be placed in for hatching, a flat spoon to stir the eggs well. This part of his plan is, we think, multiplying fixtures and magnifying diffiulties, without any possibility of increas-

ing the product of the worms whatsoever. Simplicity in their treatment, economy in the use of means, and an approximation to nature, should be the great objects to be held in view by the American silk culturist, and, therefore, we believe that the eggs will hatch just as well upon a table or shelf as any where else.

With respect to the temperature of the apartment in which the worms are hatched, it may be instructive to add the observation of Count *Dandolo*. He says:

"If the temperature of the stove room should not reach 64°, on the day fixed upon to put in the eggs, it is necessary to light a little fire, that it may raise to that degree, which ought to be continued during two days. If the thermometer indicate that the exterior air is above 64°, the shutters should be closed, and the doors and ventilators opened, to create a draught and cool the stove room. The *third* day the temperature should be raised to 66°, the *fourth* day to 68°, the *fifth* day to 71°, the *sixth* day to 73°, the *seventh* day to 75°, the 8th day to 77°, the 9th day to 80°, 10th, 11th and 12th days to 81°.

The following are the signs of the speedy vivification of the silk worm:

"The ash-gray color of the eggs grow bluish; then purplish; it then again grows gray, with a cast of yellowish, and finally, of a dingy white."

Count *Dandolo* further remarks that:

"When the eggs assume a whitish color, the worm is already formed, and with a glass, may be seen within the shell. The eggs should then be covered with white paper well pierced with holes, the paper to be cut so as to cover them all. To encourage the worms to come through the holes, small twigs of Mulberry, with but few leaves on them, must be placed on the outside of the paper, the scent of which attracts the worms: they crawl through the holes, and attach themselves to the food. The number of twigs to be increased as fast as the worms occupy those on the paper, to prevent their getting out of the boxes in search of food."

"When the worms are red at their first coming out, it is a sign that the eggs have either been bad or ill kept over winter, or over heated, that is, too much forced when laid to hatch. Worms of this color are good for nothing, and should be thrown away, since they will not produce cocoons."

"Few worms appear the first day, and if the number of them should be inconsiderable, it is best to throw them away, as it is well not to mix them with later worms. If not thrown away they should be kept on separate shelves.

Eggs which have been scraped from the paper on which they were laid, should be stirred round two or three times a day. This operation hastens their coming forth."

A prudent cultivator, says Count *Dandolo*, has done all in his power, when, on observing the season favorable, and the bud of the Mulberry shoots in a proper degree of forwardness, he has put his eggs into the room for hatching; and if after they are there, or even after being hatched, a sudden change of weather should take place, and it be desirable either to retard the hatching, or to depress the appetite of the worm, both or either can be effected by lowering the temperature of the air of the room, gradually to about 68°.

Upon this Count Dandolo remarks:

"This cooling of the air diminishes the hunger of the young silk worm by degrees, and without danger; and by these means the modifications are prevented, which at 75° would have brought on the casting or moulting much more speedily. At 95° the moulting is effected the *sixth* day, whilst at 71, it requires *six* or *seven* days. The second moulting, which at 75°, is wrought in four days, at 69 and 71°, takes six days for its accomplishment. Thus by foresight and prudence, the proprietor will be enabled to gain seven or eight days, which prevents any

ill effect from the unfavorableness of the season; and this time gained, it is evident, may be of the utmost importance."

We shall now quote from the essays of *Gideon B. Smith*, Esq. his treatment of the worms from the hatching of the insect to the completion of the cocoons. His instructions are the result of practice, backed by close observation and a sound discriminating mind. With such lights as his guide, the culturist cannot well fail to pursue the business with an enlightened economy, and to find in it a most interesting and profitable pursuit.

"The periods of moulting are, generally, about the 7th, 13th, 19th and 24th days of their age, but these periods are materially influenced by the care and attention bestowed on the worms—some worms will begin to spin on the 25th day; while others will delay their spinning even to forty-five or fifty days, according as they are well or ill attended to. At the periods of moulting, the worms do not eat, and if they all moult together, no feed need be given them; but should they not be thus simultaneous in changing their skins, those which require food should be supplied, even though the others may be disturbed by it. They are about 36 hours shedding their skins.

The Italians strenuously insist upon cutting the leaves *fine*, before giving them to the worms; but having tried this plan, I found an objection to it which induced me to reject it. When the leaves are cut fine, the worms easily press them down, and they are lost, having become a mere carpet for the worms. I therefore, never cut the leaves after the worms are two weeks old; but for several reasons, I prefer laying on the whole leaves, and even the small branches. When laid on whole, the leaves keep fresh till consumed; especially when left upon the small twigs. The small branches have another advantage—the worms can climb, and fix upon them, over and under them, so that the same shelf will accommodate many more than when the leaves are cut fine, and they are obliged to remain on a common level surface. The worms also prefer this mode, as it approaches nearer to the nature of the limbs of the tree.

Every two or three days the shelves should be well cleared of litter and excrement, to effect which, the worms may be removed in the following manner:—lay on either large leaves or twigs with leaves, and as soon as the worms attach themselves to them, bear them to a clean shelf; repeat the operation till all are removed. Some lay fresh leaves on one side of the shelf, and leave the worms to go over to them, and clear off the other side. I prefer the first plan. Very few leaves will suffice for the first ten days; a dozen, torn into small pieces, will be enough for each shelf, the 1st, 2d, 3d and 4th days; double the quantity the next two days. However, it is unnecessary to attempt estimating the quantity, as the intelligent attendant will readily discover what is necessary, and be able at all times to guard against both stinting the worms and waste of leaves. They should always have as much as they will consume, and no more. Great care must be observed that the leaves be perfectly free from wet, and fresh. When they have been kept some time, the leaves begin to turn black or dark colored, and should be thrown away. In wet weather, the leaves may be dried by taking them into a large room, spreading them out, and occasionally shaking them up.

Great care should be taken to guard against mice and ants; mice devour them with avidity; and the bite of an ant is almost instant death to the worm. Isolating the shelves from the walls, and setting the feet in basins of water, will protect them from ants; but the access of mice to the room must be cut off.

The success of the crop depends upon the cleanliness of the shelves, and purity of the air in the room, especially in hot, and more particularly in damp weather. If the excrement and litter be allowed to accumulate, fermentation and putrefaction soon commence, and the consequence will be fatal to the worms, especially in hot, damp weather; besides, the worms at all times thrive better

when the shelves are kept clean, and nothing but fresh leaves allowed to remain about the worms. To guard against impurity of air, which is the greatest enemy the silk worm has, a small quantity of *chloride of lime* should always be kept in a plate in some part of the room. It is a cheap and most effectual preventive of this cause of disease in worms, as well as a powerful remedy for the *tripes*, and other diseases that have become epidemic. It is generally sold at the drug shops at $18\frac{3}{4}$ cts. a pound, and four pounds will be sufficient for the largest laboratory. A couple of spoonfuls may be put into a plate with about a gill of water, and should be replenished every three days.

Where proper cleanliness and due attention to ventilation are observed, there is little to be dreaded from hot weather. Nevertheless, in very hot weather all the means at hand should be availed of for the reduction of the temperature of the room; for worms will thrive best in moderate temperature. But ice, or sprinkling the floor with cold water, should never be resorted to, as has been recommended; for the vapor thus produced will do more injury than the heat. When convenient, the laboratory should be shaded with high trees on the south side. An open, high piazza to shield the south front of the house from the sun's rays will also be of service. Opening the windows and doors, and the ventilators in the ceiling, will then be all that can be done to cool the room; and this should never be neglected, in hot weather. There is much more danger from cold than heat; and on the slightest appearance of a cold night, fire should be made in the fire places or stoves, and replenished as often as necessary. The temperature should be kept as equable as possible, and sudden changes guarded against. For this purpose a thermometer will be useful; but the senses of the attendant will be a sufficient substitute if care be observed. I do not pretend to give degrees of temperature most suitable for silk worms; for although we can increase the heat, it is not easy to reduce it in a large room, when the surrounding atmosphere that supplies the air circulating in it, is of a high temperature. It may be observed here, that the cold sensation felt while sitting in a current of air, is no evidence of that air or the place we sit in being of a lower temperature than the air of a room where there is no such current. The air passing over the surface of our bodies carries off heat, and thus causes the cold sensation, while at the same time the current of air, that "feels cool," is in many degrees warmer than our bodies. But silk worms are not warm blooded animals, and of course they do not experience the same relief, having no excess of animal heat to be carried off. Although many persons have assured me that they had lost many worms by hot weather, I am constrained to think, that the heat was not the sole cause of the loss, for I have never lost a worm that I could attribute to that cause. Hot weather will undoubtedly cause the destruction of the whole of them, if the litter and excrement be left unremoved; and I always suspect some such want of attention in every instance of the destruction of worms by hot weather. Heat does not injure the worms in their natural state, nor will it in their state of domestication, if they are kept as free from filth as they are on their native trees. Keeping the shelves clean, the worms not too much crowded, the air in the room pure by the use of chloride of lime and ventilation, and feeding with fresh dry leaves, I consider the best and only preventives of any ill effects from hot weather.

Between the 25th and 35th days of the worms' age they will show signs of a disposition to spin. They will become somewhat of an amber color about the joints of the body, semi-transparent, throw out fibres of silk on the leaves, and wander about. The *brush* for the cocoons should now be provided. The best and simplest that I have been able to find is the *broom-corn.* Clear it well from seed, and cut it from the stalk close to the junction of the straws: spread out the top in imitation of a small tree, and set it on the shelf with the top pressing against the bottom of the upper shelf to hold it in its position. It may be set in rows 6

or 8 inches apart, across the shelf, and over the top shelf an extra one may be placed for this purpose. The worms will readily find and climb these little trees and spin their cocoons in them; the worms will be four days spinning their cocoons, and they will all generally be finished on the 8th day after they first begin —that is, all of the same day's hatching. The brush may then be taken down, the cocoons taken off, cleared of the loose *tow*, and prepared for reeling.

The cocoons from which eggs are expected must be spread out in a room, secure from mice and ants, and in five or ten days the moths will come out of the cocoons, when the males and females will couple; they must then be taken by the wings in pairs without separating them, and placed upon sheets of paper disposed for their reception, where they are to remain. There is generally about an equal number of each sex. I have found the best mode for fixing the paper for the moths to lay on, as follows: stretch two pieces of strong twine across the room from wall to wall, about 2 feet apart, and another about a foot over the middle of these. Lay large sheets of paper (old newspapers will do) over them, and pin them down at each side to the lower twine. The sheets of paper will then be in the form of the roof of a house. As many pairs of moths as can conveniently lie on the papers may be placed there. This mode has the advantage of security against ants and mice, which are very destructive to these insects.—The room should be dark, if possible, while the insects are on the papers, and each sheet should be filled before any are put upon another, and as soon as the moths on one sheet are done laying eggs, it should then be taken down, folded, and put into a tin box in a cold cellar, where all the eggs must be kept till wanted for use next spring. The moths are in the form of a grayish white butterfly, and generally begin to lay eggs in 24 to 36 hours after leaving the cocoons. The eggs are at first of a pale yellow, or somewhat of a sulphur color, but in three days turn to a light slate color, and subsequently to a dull brownish slate color. When seen through a microscope they are speckled. Those that remain yellow have not been fecundated, and of course are worthless. Each healthy female moth will lay about 450 eggs, generally, handsomely disposed and firmly attached to the paper in a circular form, the whole covering a space about the size of a fifty cent piece.

Should the eggs be permitted to remain exposed to the warm weather, they will hatch, and, unless another crop be desired, they will be lost. This is the only injury they are liable to from warm weather. The flies eat nothing after leaving the cocoons, and die in a few days after depositing the eggs. The tin box in which the eggs are directed to be kept, is intended to protect them from insects. The eggs should be kept in a dry cellar, as mould and mildew will injure them. There will be many double cocoons, those which have two or more worms in them; these and as many more of the others as are wanted should be selected for eggs.

After clearing the cocoons of the loose *tow*, such as are intended for reeling, and cannot be wound off immediately, must be subjected to some process by which the chrysalis will be killed, to prevent its perforating the cocoon. Heat is most commonly applied. In Europe the modes of its application are various. Some *bake* the cocoons in an oven about half heated for bread; others apply steam, and others expose them to the rays of the sun for several days during the heat of the day. There is danger of scorching the silk in the first mode; of decomposing the fibres, in the second; and of not perfectly accomplishing the object in the third. I have found the following mode preferable to any other, as the object is perfectly effected without danger to the silk. I put the cocoons into a tight tin vessel, with a cover closely fitted; and put this vessel into another a little larger, containing such quantity of water as will nearly fill it when the other is put into it; the fire is then applied and the water kept boiling half an

hour, or more, according to the size of the vessel and until the cocoons in the inner vessel shall have become as hot as the boiling water. The cocoons are then spread out in a dry room, that whatever moisture there may be, may evaporate. By this mode, the heat can never be raised so high as to injure the silk, and the fibre is not loosened by moisture; on the contrary, much of the natural moisture of the cocoon is dispersed. After this operation, the cocoons are ready for the reel or for sale. All the cocoons that can be reeled in the course of the first week after they are taken from the bush, may be reeled without this operation; and a considerable advantage is gained by thus reeling them, as they unwind much easier than when they have been heated. Cocoons intended for sale, or keeping on hand for future reeling, must be secured against mice and roaches."

It has been our desire from the beginning to make our Manual a plain, practical treatise, which could be laid hold of by every man, woman and child who could read—in a word, which could be understood and practised by all; and after reading every thing within our reach, we have selected the above general rules for the feeding of the worms, and the reader will observe, that there is no mystery; no burying of meaning by the unnecessary multiplication of words, and to Mr. Smith's plan we have nothing to add, save the *net-work frames*, which at his suggestion Mr. Whitmarsh has adopted. By the substitution of these a great amount of labor is saved, and the means of health promoted, by increasing the facilities of cleansing the worms, and consequently, of purifying the apartment.

As to the *apportionment of food*, that must, in a great measure, be left to the discretion and judgment of the chief superintendent; for although it has been reduced to a certainty, that a *thousand worms* will, on an average, devour during the feeding season from *thirty-seven and a half to fifty pounds* of leaves; yet the quantity to be progressively fed out, must, to a considerable extent, if not altogether, be regulated by the wants and necessities of the worms for the time being. Their appetites must govern in the main. Whatever quantity of leaves they *consume cleanly*, from one feeding time to another, it is to be presumed has been advantageously eaten, and whenever it shall be found that more has been given than the worm can *consume*, the subsequent feeding must be lessened in quantity, while on the other hand, if they should, between those periods, be any considerable quantity, while on the other hand, if they should, betwen those periods, be any considerable time without leaves, the ensuing feeding must be increased; for while it will not do to *gorge* the worm, neither will it answer to keep him without food for any length of time, as abstinence is both detrimental to his health, and injurious to the interest of his feeder.

In the eastern states, the feeding of the worms, heretofore, has been carried on with the least possible trouble, and from what we can learn, with, perhaps, too little regard to cleanliness, to be followed in large establishments, for however well such neglect may succeed upon a small scale, if you come to carry it out in a large establishment, much positive evil will ensue in the death of the worms. Small bodies might exist under a system of inattention, which if followed in an extensive laboratory, would end in the mortality of the insects, and the pecuniary loss of the proprietor.

In *Turkey*, according to Mr. *Rhind*, "the production of silk is confined to cities or the larger towns, in the vicinity of which the Mulberry tree is chiefly cultivated; those trees belong to the Farmers, or proprietors of the ground, who do not rear the worm themselves, but during the crop season, the leaves are collected by them daily and carried into the city and sold in the market in the same manner as fruit and vegetables, in such quantities as purchasers may require. At the commencement of the season almost every family clean out all the rooms in the house, except one in which they live during the crop season; the worms be-

ing produced, they purchase a quantity of leaves and strew them over the floor, leaving a space next the wall that they may walk round and distribute the leaves; they then place the worms on the leaves, who readily attach themselves, and they daily throw on such quantities as experience teaches them will supply the want of the worms, and this they repeat until the worms are ready to rise and wind the cocoons, without ever removing the offal or straw, and frequently the pile of collected matter will reach the height of three or four feet. When the worms show symptoms of winding, they plant branches and bushes immediately over the collected mass, and the worms rise on these, the cocoons are formed and collected, and the rooms are then cleaned out and the reeling is commenced. This manipulation is performed in the most clumsy manner, and with the rudest machinery imaginable, notwithstanding which, they produce the finest silk in the world.

Now this *Turkish* method of attending to the worms is simple enough in all conscience; but it is so filthy as to be repulsive to our very nature. The Turks, as every body must know, are proverbial for their love of ease, for their lazy disposition, and hence their system of feeding worms is formed solely with the view of consulting their own idle habits; but however much we may condemn it for its want of cleanliness, we may learn important truths from its very defects and deformities. We may learn this, that the raising of silk worms is a very simple thing, unattended with any difficulty which ordinary industry and discernment may not overcome. From what we have read and seen, we deduce these facts, that nothing is wanting to ensure success to the culture—☞ *but room for the worms, a supply of food for them to eat, regularity, and cleanliness in their feeding, proper ventilation of their apartments, and untiring attention to their wants.*

The general rules laid down by Mr. Smith will be sufficient for most readers, but as there may be some that would prefer to see something with respect to the *quantities* of food to be progressively given, we will abstract from Count *Dandolo's* plan all that we esteem essential to be known upon this part of the business, and we will here remark, that from the great regard for exactitude of this distinguished culturist, the utmost reliance may be placed in his statements.

The quantity of food is the proportion given to the worms hatched from FIVE OUNCES of eggs, which, according to our reading, means 100,000 worms, allowance being made for casualties of all descriptions.

REARING OF THE WORMS.

IN THE FIRST AGE.—*First day.*—The worms should occupy a space of nearly 36 feet 8 inches square on the wicker trays or tables. They should this day receive 3⅓ lbs. of leaves chopped small, dividing their meals through the 24 hours into *four*, at intervals of 6 hours each. The worms to be fed regularly four times a day, and not to give them their food all at once—Care to be taken in giving the food to widen the square by degrees.

Second day. On this day day 6 lbs. will be needed. This will suffice for the *four* regular meals, the first of which should be the least, increasing them as they proceed.

Third day. This day 12 lbs. of leaves will be necessary.

Fourth day. This day but 6 lbs. 12 oz. of leaves must be given, as the quantity must be decreased, as the appetite diminishes: the *first meal*, 2 lb. 4 oz. and the other meals to decrease in proportion as the quantity of leaves given before, appears not to have been thoroughly eaten. It is important as the worms grow rapidly now, that they have plenty of room. At the beginning of this day, many of the silk worms begin shaking their heads, which indicates that they feel overloaded by their covering or skins. Some of them eat little but keep their heads erect. Towards the close of this day, the greatest number of the silk worms appear torpid and eat no more. As a general rule, it may be proper to

apprise the culturist, that during the time of moulting, the worms must not be disturbed; for the process of changing their skins will be thereby interrupted.

☞The hurdles or trays should be cleaned before and after every moulting, until the fourth age, once during that age, before and after the *fourth* or last moulting, and every two days during the *fifth* age.

Fifth day. This day 1½ pounds of leaves chopped small will be sufficient, to distribute whenever the worms appear disposed to eat.

Towards the end of this day the worms are torpid: a few begin to revive.

The *first age* of the silk worm is generally accomplished in *five* days, exclusive of the two days occupied in bringing them forth.

Second age.—Nearly 73 feet 4 inches square of the tables or trays, will be necessary for the accommodation of the worms from this period to their second moulting. The temperature should be from 73° to 75. The insects should not be lifted from their litter until they are nearly all revived. No harm will arise from waiting, even though it should be for twenty or thirty hours from the time the first few began to revive.

First day. For this day 9 lbs. of young tender shoots, and 9 lbs. of Mulberry leaves, well picked and chopped small.

The method of reviving the worms is thus described:

When nearly all the worms are roused, and begin moving their heads, and raising up as if they sought something, those at the edge of the paper having already left the litter on which they had lain, preparation should be made to remove them, that the sheets of paper may be cleaned. The worms should be removed from those sheets of paper first when they are perceived to be most revived and stirring. Some shoots of the young twigs of the Mulberry tree, with six or eight leaves on them should be put over the silk worms; then boughs should be placed, so that, when spread out, there may be an inch or two between them. When one of the sheets of paper are thus covered with silk worms, another must be begun, and so on until all are completed. Each, as filled, are to be removed to a clean tray, sheet or hurdle.

An hour or two after the worms have been thus removed, they should be given a meal of 3 lbs. of leaves chopped small. In the remainder of this day, the worms should have in two meals, the remaining six pounds of chopped leaves, with an interval of six hours between each. The hurdles from which the silk worms were removed, will, of course, be cleaned.

Second day. Thirty pounds of chopped leaves to be divided into four portions, should be given at intervals of 6 hours each; the two first meals less plentiful than the succeeding ones.

Third day. This day 33 lbs. of chopped leaves well picked will be necessary; the two first meals to be the largest. The leaves should be distributed in proportion as they may be wanted, and with attention. Towards evening some of the worms will begin to refuse to eat and rear their heads up, indicating their approaching the period of torpor.

As a general remark, it may be observed, that as the worms increase in size, the space allotted to them should be enlarged.

Fourth day. Only 9 lbs. of leaves will be necessary this day, as the worms will sink into torpor and shed their skins the ensuing day.

Third age.—On this day 15 lbs. of the small shoots will be necessary and the same quantity of picked leaves—the temperature of the apartment from 71° to 73° during this age. Their removal to be the same as in the previous age—the space for their accommodation 174 square feet. The 15 lbs. of young shoots to be the first meal of the worms. When they shall have eaten the leaves upon the shoots, give them a second meal of 7½ lbs. of leaves, and the remainder to be given at an interval of six hours.

Second day. This day 90 lbs. of picked leaves chopped will be needed, the two first meals the smallest.

Third day. This day 97 lbs. of leaves are to be given, the two first the largest meals.

Fourth day. This day only about 52½ lbs. of chopped leaves will be requisite, as the appetite of the worms always decrease immediately preceding their becoming torpid. This first meal to be the largest and so on to the fourth, that being the last.

Fifth day. To day only 27 lbs. of picked leaves must be given them. If, however, they appear not to have enough, more must be given them. They become torpid this day.

Sixth day. On this day the worms arouse from their torpor and accomplish their third age.

Fourth age.—The worms during this period should occupy a space of about 412 feet square—the temperature should be from 68 to 71.

First day. On this day 37½ lbs. of young shoots, and 60 lbs. of picked leaves will be needed. After the worms consume the leaves on the young shoots, they should be given 30 lbs. of leaves, and when these are consumed they should have the other 30 lbs.

Second day. 165 lbs. of leaves must be given to day; the two first meals the lightest, and the last the most copious.

Third day. 225 lbs. of leaves to day; the two first meals the most plentiful; the last meal to be about 75 lbs.

Fourth day. 255 lbs. of leaves to day; the three first meals 75 lbs. each, the 4th the remainder.

Fifth day. No more than 128 lbs. of leaves to day; the first meal to be the largest. The worms become torpid to day, and therefore, the leaves should only be distributed on such of the hurdles where the worms are perceived not to be torpid.

Sixth day. 35 lbs. of leaves are enough for to day, to be fed to such worms as may require it.

Seventh day. The worms rouse on this day and accomplish their fourth age.

Fifth age.—*First day.* The laboratory should uniformly have 68 to 70° of heat—and occupy a space of 917 square feet. After the fourth moulting, the leaves should consist of the full grown leaves of the old trees. The hurdles must be cleaned every two days during this age. They must have 180 lbs. of leaves, 90 lbs. the first meal, the other 90 lbs. to be divided into 2 meals at interval of 6 hours each.

Second day. 270 lbs. of leaves to day; the first feed 52 lbs., the other three more plentiful, the last being 97 lbs.

Third day. The worms will require 420 lbs. to day, to be divided into four feeds; the first should be 77 lbs. of leaves, the last feed should be the largest, and of about 120 lbs. of leaves.

Fourth day. To-day they require 540 lbs., the first feed 120 lbs. and the last 150 lbs., the other two 135 lbs. each.

Fifth day. 810 lbs. picked leaves to be given the worms this day. The first feed 150 lbs., the last 210 lbs., and besides the regular four meals, should the worms devour their apportionment in less than an hour and a half, they should receive some leaves in the intermediate time, and should they appear to require more food than the designated quantity, they must have it, as it is important to give them whatever they will eat with avidity.

Sixth day. The worms must have 975 lbs. of picked leaves to day, to be divided into *five* feeds; the last of which should be the most plentiful. If

the worms feed voraciously at this period, and it is difficult to limit the amount, the culturist will, if it appears to him necessary, give an extra or intermediate feed.

Seventh day. The worms will require 900 lbs. of leaves this day; the first meal should be the largest, and those following should be diminished; and should intermediate meals be required, they must be given, as it would not do to let the worms suffer now. They this day attain their largest size and greatest weight.

Eighth day. This day 660 lbs. of leaves must be given in four meals; the first of which to consist of 210 lbs. of leaves.

Ninth day. 495 lbs. of leaves to be distributed to day, as it may be wanted.

Tenth day. 240 lbs. of leaves to be given to-day as may be required. The hours of feeding however, to be left altogether to the discretion of the culturist, as it is impossible to anticipate the peculiar necessities of the worms this day; and it is equally difficult to ascertain whether some of the worms may not require feeding the ensuing day.

This last day they attain perfection, which may be ascertained by the following indications:

1st. When, on putting some leaves on the wickers, the insects get upon the leaves without eating them, and rear their heads as if in search for something else.

2d. When on looking at them horizontally, the light shines through them, and they appear of a whitish yellow, transparent color.

3d. When numbers of the worms which were fastened to the inside of the edges, and straightened, now get upon the edges, and move slowly along, instinct teaching them to seek change of place.

4th. When numbers of worms leave the centre of the wickers, and try to reach the edges, and crawl upon them.

5th. When their skins become wrinkled about the neck, and their bodies have more softness to the touch than heretofore, and feel like soft dough.

6th. When their rings draw in, and their grecnish color changes to a deep golden hue.

7th. When in taking a silk worm in the hand, and looking through it, the whole body has assumed the transparency of a ripe yellow plum. When these signs appear in any of the insects, every thing should be prepared for their rising, that those worms which are ready to rise, may not lose their strength and silk in seeking for the support they require.

Note.—And here we would remark that the time of the spinning of the worms may be accelerated by frequency of feeding. If fed four times during the day at regular intervals and twice at night, they may be made to anticipate their regular period of going to work a week. The culturist will, however, observe, that if he resort to this extra system of feeding, he must take care that he do not over feed them, and that the periods of feeding be judiciously divided.

GENERAL OBSERVATIONS AND RULES.

The reader will have perceived that to each day of the feeding season, a given quantity of leaves has been allotted by the diary above. This quantity in general will, doubtless, prove correct; but then the judicious, observing culturist, must not rely on these prescriptive allowances, but exercise his own judgment from day to day, with respect both to the quantity of leaves to be given, and the time when, the worms should be fed. Circumstances over which he can have no control, may operate to make the appetites of the worms keener at one time than at another; this will be indicated by the avidity with which they will consume their food. Whenever the culturist discovers that the worms have eaten all the leaves given them, sooner than usual, he must give them an additional supply to stay

their appetites till their regular hour of feeding, as it is injurious to let them remain for a long time without nutrition.

The culturist will also regulate the space occupied by the worms on the feeding shelves, as they may grow in size, it being a desirable object always to give them ample room. As we have before urged upon his consideration, he will at all times take care to have the apartment, of a *large* establishment, of the proper temperature, as much depends upon it for the success of the labors of his worms; a sudden transition from heat to cold, as well as dampness, injuriously affect them.

While care must be taken not to let the worms remain too long without food, over feeding must be equally guarded against. This being the case, the sensible culturist will at once perceive the necessity for bringing his own powers of discrimination and observation into play, and that, therefore, all that the teacher can do is to give *general rules*, leaving their application and modification with the culturist. It may be laid down as an unerring principle, that the more leaves the worms consume with avidity, and in a healthful condition, the more silk will they yield. Count *Dandolo* recommends chopping of the leaves throughout the whole period of feeding; Mr. *Smith*, however, and other American feeders, think it wholly unnecessary after the two first weeks. Our experience has convinced us that it is scarcely necessary to chop the leaves at all, as from the tenderness of the leaves when first developed, the worms however young they may be, will eat them whole; and such being the case, we would ask, where is the necessity of multiplying labor by preparing them. We all know that in their wild state they make out to masticate the leaves without any chopping, and we conclude that they can do so when placed on their hurdles.

During the time of moulting or changing of their skins, the worms must not be disturbed.

The hurdles, or shelves on which the worms are fed, should be cleaned before and after every moulting, until the fourth age, and then, as we have before urged, once during that age, before, and after, the fourth or last moulting, and every two days during the fifth age.

The worms of different ages should be fed on shelves by themselves, as those of unequal ages and inequality of sizes, do not thrive so well when promiscuously fed together.

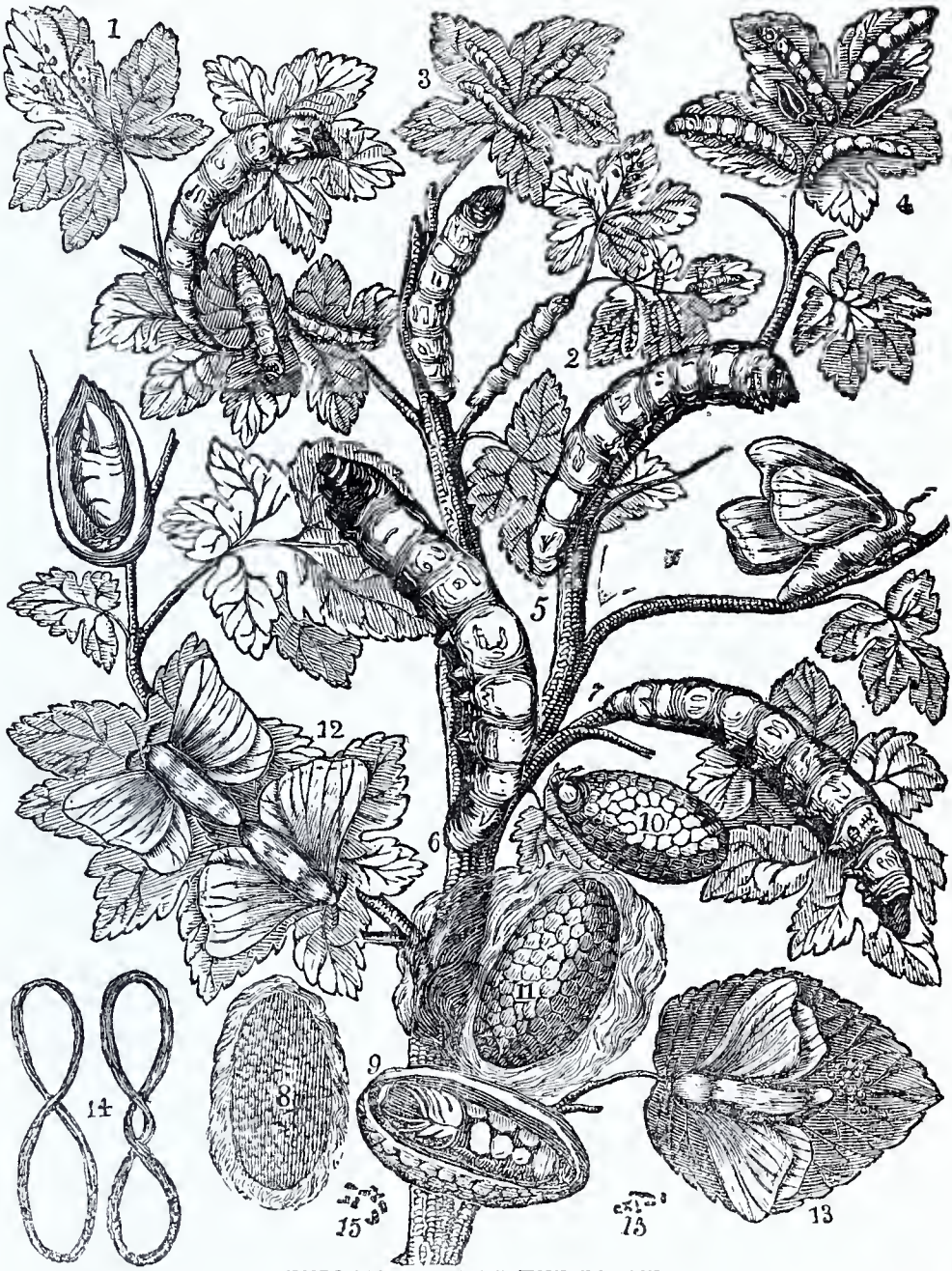
Care must be observed in picking the leaves for the worms during their two first ages, such as picking off the twigs and stalks of the leaves, and to clean them of all hard and useless parts.

As a general rule it may be proper to remark, that the chief superintendent will always be able to ascertain whether a healthful atmosphere be prevailing in the apartment, by the fact, that if it be so, he will be able to breathe as freely in the laboratory as in the open air, and feel no other difference than what may arise from the heat in the interior apartment. When any difficulty of breathing exists, it should be remedied, and may be easily done by the admission of fresh air from without, and by burning some straw or shavings in the apartment. The burning of shavings, in all cases where the air of the room is damp, is recommended, as from the briskness of the fire, it much sooner distributes its heat through the apartment, and thus corrects the humid condition of the atmosphere.

The culturist will not omit to keep plates of chloride of lime, say three or four, distributed through the apartment, as it is, possibly, one of the best correctors of impure air within the power of science to apply, and therefore eminently promotive of health.

While the sun is pouring its rays upon the windows of the laboratory, the shutters should be closed, the ventilators of the apartment kept open. The windows

REPRESENTATION OF THE DIFFERENT AGES OF THE SIK WORM.



EXPLANATION OF THE PLATE.

1. The egg, or the development and birth of the caterpillar.
2. The silk worms during the first age, till their first moulting.
3. Rearing of the worms in the second age.
4. The worms in their third age.
5. The rearing of the silk worm in the 4th age.
6. Of the rearing of the silk worms during the 5th age, until completion of the cocoon.
7. A species of silk worm, of a dark grey color, with singular marks.
8. The cocoons.
9. Two open cocoons, or cocoons with their grubs. The upper one contains only the shell of a developed chrysalis; but in the lower is seen the immature chrysalis, with the skin of the late moth.
10. A cocoon from which the butterfly is near emerging.
11. A cocoon from which the butterfly has already escaped.
12. Two butterflies in the act of coupling.
13. The female moths laying eggs.
14. Raw silk of a yellow or white color.
15. Represents the excremental substance of the silk worm in its first and last age.

also, to be kept open from evening until sunrise, unless the weather should be very damp or wet.

PREPARATION FOR FORMING THE COCOON HEDGE, &c.

With respect to the accommodation of the worms with conveniences for spinning their cocoons, we would barely refer the reader to Mr. Smith's plan to be found in page 48, with these additional remarks: that should the culturist adopt the net work frame, for the purpose, brush wood of all kinds will be superfluous. In Europe hurdles of twigs of chesnut, hickory, oak or of birch, such as brooms are made of, are used. As soon as it is observed that the worms want to rise, the faggots or brush-wood should be put against the inside wall before the trays of the most convenient size, leaving fifteen inches between each bundle or faggot. The twigs or top branches of the hurdles should touch the lower part of the tray above that on which it is placed, and by being bent down by the tray above, form a species of arch, to be given such an angle or inclination as not to be too sharp to prevent the worms from retaining their position firmly with ease. The branches should be spread out somewhat like fans, so as to permit the air to penetrate freely. Before the worms mount for spinning their coeoons, the hurdles or trays should be well cleaned, and the litter removed out of the laboratory. The cabins or arches formed as above directed should be about two feet from one to the other. When the cabins or arches are nearly laden, should there remain any silk worms for the trays, shelves or hurdles, a small branch may be put against them, and thus prevent their lying too thick together.

Two things are particularly to be attended to: the first is, to put those worms near the cabins or arches, which are perceived to be ready to rise; and the second is, to give a few leaves to those worms that are still inclined to eat. It will, therefore, be necessary in a large establishment to place this part of the business in eharge of a careful person or two, as long as the worms feel disposition to eat; if but a mouthful, they should be indulged. It often happens that after the great majority of the worms have risen, that a portion will remain on the hurdles without manifesting any disposition either to eat or rise, appearing motionless. These should be removed to a clear, dry place, where they may enjoy a temperature of 73°, and have fresh leaves distributed over them, when they will speedily revive, and descend and weave their eocoons. If they should need it, bandages of straw might be placed through the branehes to act as couches or supports to the more feeble worms.

As soon as the worms have all risen, the hurdles must be cleaned without delay.

When the worms manifest a disposition to rise, the temperature of the laboratory should be carefully maintained between 68° and 71°, as any violent agitation of the air, or sudden change at this particular period is detrimental to the worms. Care also should be taken to keep the air *dry;* and the chloride solution well kept up. Worms which may fall after having risen, should be placed in another situation among the more feeble ones. All diseased and dead worms should be removed immediately, and all offal should be also removed, as nothing tends more readily than a vitiated atmosphere to occasion a fermentation of the dirt and leaves. The due observanee of *cleanliness*, purification of the room, and equable circulation of air, contribute no less towards the health of the worms, than to the profit of the culturist. A too dry, or too warm atmosphere, are both to be avoided, as the tendency of each is to dry up the worms, and produce eontraction of the skins.

It may not be amiss here, to emphatically state,—the worms must have sufficient room to perform their labors in; they must be regularly fed, kept elean, and the air of their apartment preserved alike from excess of eold or heat, or from too much aridity or dampness—in a word, cleanliness and comfort must be consulted,

and when these shall have been attended to, the whole mystery of profitably feeding worms, will have been not only fully comprehended, but mastered.

VARIOUS STAGES AND APPEARANCES OF THE WORMS.

Towards the end of the fifth day the worms are torpid: a few will begin to revive.

After the first moulting, the silk worm is of a dark ash color and shows motion; the rings that compose its body stretch and shrink more freely than before. The worms when first hatched take 56,626 to make an ounce; after the first moulting 3,840 are sufficient to make up that weight; thus in six days the worm increases fourteen times it own weight: at first it is but the twelfth of an inch long. On the eighth day it becomes torpid.

On the 9th day, the worm becomes of a light gray, the hair hardly to be perceived by the naked eye, and becomes shorter; the muzzle, which, in the first age, was very black, hard and scaly, becomes immediately upon moulting white and soft; but afterwards again grows shining and black as before. As the insect grows older, at each moulting, its muzzle hardens; because it needs to saw and bite larger and older leaves. Its size is increased to half an inch, and part become roused this day and part on the 10th. On the 14th day they go into torpor again; just preceding this state, the insect seeks free space to slumber in, rearing its head upwards. When on the point of sinking into torpor, they completely void all excrementitious matter, and there remains in their intestinal tube a yellow lymph alone. When the worms prepare for the 3d and 4th moulting, the ventilators must be opened.

On the 15th day, the worms begin to rouse, and thus accomplish the third age. The head and body are much enlarged since the casting of the skin.

On the 20th day, the worms become torpid: rouse on the 22d day. After this moulting, they are of a darker color, grayish with a red cast, but continue to whiten.

By the 30th day of their being fed, the worms begin to advance towards maturity, which may be perceived by their yellow color, which increases from ring to ring. Their backs begin to shine, and the rings lose their dark green color. The advance to maturity is also evinced by diminution of bulk, and by ther seeking to fix themselves on the edge of the shelves or hurdles, to void the substances with which they are loaded. When these signs are apparent, the offal and excrement must be cleaned off and removed, light fires raised, and the apartment fumigated.

On the 30th day, the yellow hue of the silk worms grows deeper, their backs shine more, and in some, the rings assume a golden appearance, the muzzle becomes a brighter red.

On the 32d day, they generally attain perfection, which may be known by the following indications:

1. When on putting leaves on the shelves the worms get on them without eating them.
2. They appear of a whitish yellow, transparent color.
3. The worms get upon the edges and move slowly along, instinct urging them to seek a change of place.
4. Their rings draw in, and their greenish color becomes a deep golden hue.
5. Their skins become wrinkled about the neck, and their bodies have more softness to the touch than heretofore, and feel like soft dough.
6. In looking through the worm, the whole body, it will be seen, has assumed the transparency of a ripe yellow plum.

When these signs are manifest, it is time for them to mount.

VARIOUS QUALITIES OF COCOONS.

Dandolo says the cocoons may be divided into two general heads or classes; the *white* and the yellow. In the yellow we meet with all the shades from a bright yellow, diminishing, at last, to white: some few are a pale green.

There are, he says, *nine* different qualities, which he thus describes:

1. The *good* cocoons are those which are brought to perfection and are strong, hard, of a fine grain, and but little or not at all spotted.

2. The *pointed* cocoons are those of which one of the extremities rises up in a point, and are difficult to reel, because when the thread comes round to the hole, it is, of consequence, broken, and the whole contains nothing but ends.

3. The *cacalons* are a little larger than the others; yet they do not contain more silk, because their contexture is not so strong.

4. The *doupion*, or double cocoons, are so called, because they contain two, and sometimes three worms. They interlace their threads and make the silk called *doupion*.

5. The soufflous are imperfect cocoons, the contexture of which is loose, sometimes to that degree that they are transparent, and bear the same proportion to a good cocoon, as a gauze to a satin. These cannot be wound.

6. The *perforated* cocoons are so called, because they have a hole at one end; for which reason they cannot be *wound*.

7. The *calcined* cocoons are those in which the worm, after the formation of the cocoon, is attacked with a sickness, which sometimes petrifies it, and at other times, reduces it to a fine white powder, without in the least damaging the silk. On the contrary, these cocoons produce more silk than the others, because the worms are lighter. They are to be distinguished by the noise the petrified worm makes when the cocoon is shaken.

8. The *good choquettes* consist of those cocoons in which the worm dies before it is brought to perfection. They can be distinguished from the others, because they do not rattle when shaken. They produce as fine silk as the others; but should be wound separately, as they are subject to furze out, and the silk is neither of as bright a color, nor so strong as the rest.

9. The *bad choquette* is composed of defective cocoons, spotted or rotten: many of them may be wound together, but make very foul, bad silk, of a blackish color.

HOW TO JUDGE A COCOON.

To judge whether a cocoon be good, observe if it be firm and sound: if it has a firm grain, and the two ends round and strong, and capable of resisting pressure between the thumb and finger. The cocoons of a bright yellow, yield more silk than the others, because they have more gum. Pale cocoons leave less gum, lose less in winding, and take a better white or pale blue.

GATHERING OF THE COCOONS.

Strong healthy worms, in three days and half from their time of moulting, will complete their cocoons, and this period may be shortened by increasing the temperature of the apartment. On the other hand their labors are prolonged by a colder temperature than has been fixed, as also by feeble health. Transitions from heat to cold, as well as a vitiated atmosphere and sudden draughts of wind before the cocoons are sufficiently advanced to afford them shelter, are injurious. The cocoons will be fit to be taken off from the 7th to the 10th day. The gathering must be commenced below and continued upwards, and the cocoons that feel *soft* should be kept by themselves. When the cocoons are detached, the down or floss, in which the silk worms have formed the cocoons, should be taken off. The floss silk ought to be collected and kept separate.

CHOOSING THE COCOONS FOR THE PRODUCTION OF EGGS.

About two ounces of eggs, which will yield, allowances being made for accidents, 40,000 worms. The small cocoons of a straw color, with hard ends and fine webs, and which are a little depressed in the middle, as if tightened by a ring or circle, are to be preferred. There are no certain signs to distinguish the male from the female cocoons; the best known are the following:

The smaller cocoons, sharp at one or both ends, and depressed in the middle, generally produce the males; the round full cocoons, without ring or depression in the middle, usually contain the females. As, however, all marks may fail, an extra number of the best should be taken for eggs, and when the moths come out, the males and females being easily distinguished, an addition, should there be a deficiency of either sex, can be made, from the double cocoons, to the defective side. In the sced cocoons, however, the double ones are to be avoided, and only to be resorted to, to supply a deficiency.

By shaking the cocoon close to the ear, we may generally ascertain whether the chrysalis be alive. If it be alive and loosened from the cocoon, it yields a sharp sound, when dead it yields a dumb one, and is more confined in the cocoon.

If white silk be desired, the choice must be made among the white cocoons exclusively. The cocoons intcnded for seed should be stript of the floss, that the moth may not be embarrassed when it first appears, and the cocoons thus sortcd, should be laid separate. It is recommended by some writers, that the selection of cocoons for seed should be from among those that were spun the earliest, but we hardly think that can be considered essential. The cocoons when selected for seed should be spread out thin, and in from two to two and a half days the moths will come out, when they should be placed in pairs, male and female, on the paper arches to be formed across the room, as described by Mr. Smith, and there permitted to couple and lay eggs. Each healthy female will lay about 450 eggs.

While the moths are coupling they should not be disturbed by noise, but be permitted to *enjoy* each other's society in quiet; the room should be darkened, and its temperature kept at from 66° to 73°.

If there be an excess of males, they must be thrown away; if of females, males must be allotted to them, which have already been in a state of union. Thc males ought not to remain united more than six hours; after the expiration of that time, they should bc gently separated. As the males are disunited, they must bc put upon the frame to be in readiness to attend to the calls of any females that may require being *served:* the preference, of course, to be given to the most vigorous.

KILLING OF THE CHRYSALIDS.

The killing of the chrysalids must be attended to as soon after the gathering of the cocoons as possible, to prevcnt their being pierced by the moth, whereby the web would be injured. Each silk pod consists of one single thread, the length of which varies from 900 to 1,200 feet. We have already given Mr. Smith's plan for effecting this part of the process, and will now state the several other modes pursued in Europe.

The Italian method simply consists in exposing the grub in the cocoons to the ardent *heat* of the sun, during three days, when the thermometer is at 88° 2 Fahr. from 10 o'clock, A. M. until 4 o'clock, P. M.

Thc French plan is to put the cocoons into an oven with a bag, with the temperature standing at 88° 2 Fahr. The oven being shut and the bags frequently stirred, the grubs are killed within four hours.

In Germany they are killed by steam proceeding from boiling water. A kettle of boiling water being prepared, fixed in the wall, a clean basket is then placed

over it on two pieces of wood; cover the basket with three or four folds of woolen cloths that the steam may penetrate completely. The water in the pot must be kept boiling for three hours, which will be sufficient to kill the chrysalids, which can be ascertained by opening one of the cocoons. They must then remain undisturbed until the following day, when they will have been sufficiently hardened to be removed, being then fit for reeling or for sale. Suffocating with brimstone, or turpentine oil, are sometimes adopted; but we think neither are to be recommended.

The process of killing the chrysalids, should be gone through with, within twelve days after the completion of the cocoons, and the sooner thereafter the better.

PRESERVATION OF THE EGGS.

Collect the papers on which the eggs are laid, when *quite dry*, fold them up and put them away in tin boxes, or some glass vessel, which must be well stopped, so as to exclude the air, in thin layers. They should be kept in a *dry*, cool cellar, or some other cool place, where the temperature does not exceed 65°, nor descend below the freezing point, 32°—where water will not freeze.

Being thus placed, they may remain there until the following spring, when the time to hatch them shall have arrived.

KEEPING THE EGGS OVER.

If the culturist designs feeding a second crop of worms, he may do so by keeping the eggs over, that is by delaying the time of hatching of such portion, which may be done in the following manner:

Let him *as soon as the spring opens* place his tin box or jar or bottle containing the eggs, in an ice-house. The box, jar or bottle to be placed on the ice, so as that when the ice from melting sinks down, the vessel in which the worms are, may go down with the body of ice, and thus be preserved in the proper temperture of cold to stay the hatching of eggs.

By pursuing this mode, two or more feedings of a season may be effected; but we do not recommend its being pursued, because we believe that the culturist should be satisfied with the profits of one feeding.

In any cool dry cellar the hatching of the eggs may be delayed till the 1st of June, by which time foliage will be plentiful.

PROPORTION OF EGGS TO COCOONS.

The relative proportion of eggs depends very much upon the care and attention that may be paid to the feeding of the worms, the degree of nutrition in the leaves, the vigor with which they may have fed, and the degree of health maintained during the feeding season. The cocoons are like all other crops, some heavier, and some lighter than others. In Tuscany, 150 cocoons have made a pound. In the early settlement of Georgia, 200 cocoons from worms raised in that state, weighed one pound; but these were extraordinary cocoons, and, therefore, cannot fairly be taken as the basis of a calculation; because it has severally taken, in other places, 208, 240, 262, 267, 271, 306, 328, 490 and 600 to make a pound. We have adopted as our *ratio* 300, which with ordinary care, we think may be assumed as a safe one. With respect to the gross quantity of silk produced from an ounce of eggs, there is the same difference: all depending upon the asssiduity and energy of the culturist, who, as he wills it, may either produce 40 or 120 pounds of cocoons. Instances have been given, and are well authenticated, where, in an establishment in which 6 ounces were annually hatched for 10 consecutive years, the average yield to the ounce of eggs, was 100 pounds of cocoons, or 11 1-9 pounds of raw silk. Now if the *casualties* had reduced the worms down to our standard of 20,000 to an ounce of eggs, and that is about the fair average number, then an acre would produce 305 pounds of silk. This is a very large yield, and of course should not be relied upon, or at all events no one

should be disappointed at a greatly diminished production, though we by no means would discourage the hope, that even a larger produce might not be raised in either New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Louisiana, Alabama or Mississippi.

Our table, it will have been perceived, sets 22,640 eggs as the number contained in an ounce; this is arbitrary, having deducted nearly 33 per cent. as the presumed loss.

ENEMIES OF SILK WORMS.—RED ANTS.

These are deadly insects to silk worms. To prevent their attacks, the posts containing fixed shelves ought not to touch the ceiling, nor must the leaves reach the walls, and their legs should either be smeared with Molasses, or placed in basins of water, or perhaps both would be best.

The smaller varieties of birds are very fond of them, but as these would not enter while there are persons in the apartment, there is not much danger to be apprehended from them.

Fowls, *mice*, *rats*, weazles, lizards and spiders are also their enemies. If the apartment be infested with mice and rats, they must be trapped and killed: from weazles and lizards not much need be feared, and as for the spider, though a deadly and destructive foe, the *broom* must be made to render him his quietus.

DISEASES OF THE WORMS.

It may be assumed as a sound proposition, that nearly all the diseases to which this noble insect are subject, arise from *foul* air or from an *irregular* or *overheated* apartment; from exposure to sudden atmospheric transitions; from too close crowding; from the too great accumulation of filth, and from improper food. There may be cases where the exciting cause of disease springs from some particular condition of the air, against which prudence, foresight, and art, cannot avail. And as it is useless to speculate upon that over which we have no control, and which depends upon contingencies that may or may not occur, let us rather turn our attention to those enumerated diseases, the cause of which we know.

DISEASES FROM DEFECTS IN EGGS.

When the eggs are too thickly heaped together, they become heated even at a low temperature, and the embryo becomes injured; there are also other causes which injuriously affect the eggs, such as the imperfect impregnation of the eggs (dubio,) and dampness; but all these, except the defective impregnation, may be guarded against.

It is maintained that no disease will occur, if the temperature of the place where the moths are kept, be maintained between 68° and 70°, when the apartments are dry and free from vitiated air, and when the eggs are carefully kept. Low marshy places are unfavorable, as heat and moisture is highly injurious to their healthful existence—high dry situations are always the best, both for the worms and the Mulberry.

DISEASE FROM IMPURITY OF THE AIR OF THE LABORATORY.

It is surprising to find how large a portion of mephitic air disengages in a large establishment, particularly in the fourth and fifth ages from the silk worms. The damp stagnates in it, the transpiration is checked, the dung and litter undergo the process of fermentation and emit noxious exhalations; the skins of the worms become relaxed, and disease follows in a few hours, and hence the necessity of using the means, which we have before alluded to, of ensuring a renewal of pure air, by the expulsion of the heavier, and replacing it by light, fresh, exterior air. The burning of shavings in the fire places or stoves, or the fumigation of the apartment, are the most efficient means; indeed they are the only ones to be relied upon. It may be well to remark here, that if cleanliness be observed, it will scarcely ever be necessary to apply other means than the solutions of chloride

of lime, and to be candid, we believe this agent the best under any circumstances. Its affinity for putrescent animal matter is proverbial; nor is it less so with fermenting vegetable substances. Count Dandolo, however, has the following recipe which he recommends, as being eminently active as an anti-putrescent agent:

Take 6 ounces common salt, mix it well with 3 ounces of oxyde of manganese; put this mixture in a strong bottle with 2 ounces of water, cork it well. Keep this bottle in a part of the laboratory farthest from the stoves or fire places. In a phial put 1½ lbs. of sulphuric acid, (oil of vitrol,) and keep it near the bottle, with a small wine glass and an iron spoon. Put in the wine glass two-thirds of a spoonful of oil of vitrol, pour it into the large bottle, and there will issue a white vapor. Move the bottle about the laboratory, holding it up high to let the vapor spread through the air. When the vapor ceases, cork up the bottle and replace it. During the fifth age of the worms, it is good to repeat this fumigation three or four times a day. During each successive repetition, the quantity of oil of vitrol may be diminished. The quantity stated is sufficient for a laboratory of five ounces of eggs.

The necessity for the use of this remedy may always be known by the presence of an unpleasant effluvia in the room, or a closeness of the air and difficulty of breathing.

The fumigation should always be renewed after each cleansing of the hurdles or shelves, and in moist damp weather.

The use of oil of vitriol, is, as the reader is sensible, subject to its dangers. If dropped upon the clothes or skin, it will burn, and its vapor if inhaled too closely, would be injurious. The way to guard against its bad effects, is to hold it above the head, and thus avoid its searching, dangerous and unpleasant exhalations. Should the mixture in the bottle harden, dilute it with water.

The following is given as the good effects of fumigation:

1. It destroys unpleasant effluvia; 2. it dimishes fermentation; 3. it neutralizes the effects of miasmata and deleterious emanations; 4. it revives the silk worms, by means of the gentle stimulating effect of pure vital air;—and 5thly, it influences the goodness of the cocoon. This fumigating preparation would cost about 30 cents.

DISEASE FROM CHANGE OF FOOD.

If the diet of the worms after being fed on one kind of leaves, or food of any kind, be changed to another more congenial to their appetites, great danger is to be apprehended from their eating to bursting; the feeder, must, therefore, use his judgment in feeding them sparingly at the onset.

Diseases also arise from a peculiar constitution and from sudden changes of the air; but these can be easily guarded against by observing what we have already said on this subject.

PARTICULAR DISEASES.

The Passis. This disease appears after the first moulting, when the worms advance unequally in growth; they are observed to be short, thin and without vigor or appetite: it is ascribed to their being too much heated in their early state. The remedies consist in separating them from healthy worms, putting them in another apartment well ventilated, giving them tender leaves, and in preserving them in an uniform temperature, a little higher than that in which the healthy ones are kept.

The Grasserie. This disease appears towards the second moulting, and in the third or fourth ages. Its cause is ascribed to the food being too substantial or nourishing for the young worms, occasioning indigestion; hence they swell, their bodies become opaque and of a green color, and their skins tear from the least touch, and sometimes, spontaneously from over distension. Their bodies are also covered with an oily, viscous humour which transudes the skin. If this

be the cause it is an easy matter to prevent the occurrence of the disease, by feeding the young worms through the first, second and third ages, with young tender leaves.

The Lusette. About the fifth age, silk worms are attacked with a disease called *luzette* or *elairette*, from the shining appearance of their bodies. Their heads also increase in size, and they ultimately die without forming their cocoons. The cause is neglect in the regular supply of leaves. The means of prevention as well as cure are easy. Regularity in feeding effects the first, and separation of the silk from healthy worms, and the supplying of the invalids with food in a gradual manner, so as to restore them without subjecting them to an opposite disease arising from a too sudden repletion, is the last.

The yellows. This disease appears towards the end of the fifth age, when the worms are filled with the silky fluid and are about to spin. It proceeds from exposure to sudden intense heat, and its symptoms are yellowness and swelling of the body, an enlargement of the rings, an appearance of the feet being drawn up from the puffiness of the surrounding parts. They cease to eat and run about, leaving stains of a yellow fluid, which exudes from their bodies. The yellowness first appears round the spiracles or breathing holes, and gradually diffuses itself over the body. It may be called a dropsy of the skin, arising from the infiltration of the nutritive fluid through every part of their bodies, and they soon become soft and burst. The acid humour issuing from them, will kill any worms that touch it. This disease has its origin in indigestible food and exposure to cold during rainy weather. The diseased worms must be removed to a separate apartment, where a change of air, aided by fires, may cure them. Oak leaves fed to the worms in two instances effected a cure.

The muscardine or *numbness.* This disease shews itself in the fifth age, by black spots in different parts of the worm. These spots afterwards become yellow, and finally red, or the color of cinnamon, which is diffused over the whole body; the worm becomes hard and dry, and is covered with a white mould. The remedy is fumigation and admission of fresh air.

The tripes or *mort blanc.* This disease appears generally during moist or rainy weather, but is sometimes produced by the confined exhalations of the worms and their litter. The symptoms are, the worms become flaccid and soft, and when dead, preserve the semblance of life and death; but they soon turn black and become putrid. The *remedies* are—the atmosphere of the apartment should be warmed, and made to circulate by lighting brisk fires in the chimney; and by the removal of the diseased worms to another room.

This is a most formidable array of diseases, but the discriminating reader will have perceived, that they are in fact nearly one and all the same disease, assuming, to be sure, somewhat different types and forms, but all referrible to the same general cause, viz:—*impure air, too contracted room, exposure to sudden atmospheric transitions, to irregular feeding, over feeding, stinted feeding,* and to *improper food:* so that after all, there is not one exciting cause in the whole catalogue of diseases, that is not perfectly within the control if the culturist, and therefore, if his worms suffer by sickness the fault is with himself; for there is not one of those maladies which may not be prevented by proper attention to *feeding* and *temperature.* There is nothing more simple in all its bearings than the management of the worms, if the proper vigilance be resorted to, to preserve them in the possession of health; but if negligence and wanton neglect be indulged in, these causes will assuredly prove destructive to the interests of the culturist, in the generation of diseases and production of mortality among his worms. For ourself, we regard the *diseases* enumerated as of little account, because in the vigilance, energy, and good sense, of such of the American people as may engage in it, we behold the sure guaranties that nothing will be jeoparded or lost by

want of attention and care. Indeed, we hold these diseases to be of such trifling account, that did we not desire to deal with perfect ingenuousness, we should not have named one of them, as we believe they are formidable only in name, and may *all* be prevented by following the rules prescribed.

VARIETIES OF SILK WORMS.

Count Dandolo describes the following distinct varieties of silk worms, viz:

1. *Silk worms of three casts or moultings.*—The eggs of this kind are to be found in Lombardy; the worms and cocoons are two-fifths smaller than those of the common sort. Their cocoons are composed of finer and more beautiful silk than the common cocoon, are better constructed, and according to weight yield a greater quantity of silk; require four days less care than the common worms; are strong and hardy, and promote a saving of time, labor and money.

2. *Large silk worms of four casts.*—These worms are of a very large quality, the eggs were obtained in Friuli; they yield a much larger cocoon than the common species; 150 of the large sort weigh a pound and a half, while it requires 360 and upwards of the ordinary cocoons to weigh as much. The silk is coarser and not near so pure, and the worms five or six days later than the others in attaining their full growth, and in rising, than the common silk worm.

3. *Worms that produce white silk.*—This species was introduced into France about fifty-two years ago, from China, but was not much cultivated until about twenty-four years past, and is much prized.

Count Dandolo says, that he has raised a large quantity of these, and found them in all respects equal to the common silk worms of four casts. That if he reared silk worms for the purpose of spinning the silk himself, he would cultivate only the silk worms of three casts, and those that produce white silk, as preferable to all others, and every year would choose the very whitest and finest cocoons, to prevent the degeneration of the species.

The following varieties may also be added to the number:

4. In Windham county, Connecticut, there is a small pale white worm, which it is said eats but twenty days, and produces fine white silk, though in less quantity than either the common large pale white, or dark colored worm; but it has the good quality of retaining its color, and does not turn white by washing or by exposure to sun and air. These worms also produce two crops.

5. *A dark drab colored worm.*—This variety is very common in the U. States, and are called "black"—they live longer and make more silk than the large white worms.

6. *Silk worms of eight crops.*—At the silk establishment of the British East India Company at Jungepore, Bengal, Lord Palencia, besides the common annual silk worm which gave but one crop, found two others; the one commonly reared, and supposed to be indigenous, is called Dacey, producing eight harvests —also another, but greatly inferior, called the China, or Madrassa, which yields eight times a year.

7. The *Mammoth White*, a very superior variety, furnishing cocoons of a large size and fine texture.

8. The *two crop variety*, whose eggs are said to possess the power of hatching out the first season, thus giving the culturist an oportunity of having a second crop from the eggs of the same worms in one season.

The following instances we copy from the Treasury Manual, to show that two crops a year have been raised in the United States; and to use a very trite adage, what has been done, may be done again,—therefore, we incline to the belief, that it is within the power of a vigilant culturist, residing in those States, in which the heat of summer continues long, to make double crops; but then, we question much, whether any calculations should be predicated upon such results,

as they must necessarily depend for success upon circumstances, in our eccentric climate, too uncertain to rest any well grounded hopes upon.

"In the month of March, 1826, Mr. Seth Millington, *Prairie Haut*, St. Charles Co., Missouri, received a few silk worm eggs from Philadelphia, which were kept in an upper room without fire, and hatched early in April: they were fed the first week on lettuce, afterwards on the leaves of the White and native Mulberry tree, and came to maturity, within from twenty-four to thirty days, and spun their cocoons before the 12th of May.

On the last day of May and first day of June, the moths came out and laid their eggs on paper, which was loosely rolled up and placed in an open room. Within eight or ten days from the time the eggs were laid, they began to hatch, and before the 15th of June, nearly one-twentieth part had hatched; and the worms were healthy, fed well, grew more rapidly and came to maturity in a few days less time, than the first crop. They wound their cocoons on the 1st day of July; or the last of that month, and 1st of August, the moths came forth and laid their eggs, which were placed in the same room as the first eggs. On the 12th and 18th of August, these eggs were hatched. The worms came to maturity and spun their cocoons in less time than the first, viz: before the middle of September, the moths came forth, and laid their eggs in the first days of October."

"Messrs. Weiss and Youngman, of Bethlehem, Pa. raised two crops during the year 1825. The worms of the second crop appeared more vigorous and healthy than those of the first; they also produced large cocoons, the silk of which was of a better quality.

"Two attempts, however, by Messrs. Terhoeven, of Philadelphia county, Pa., in the years 1826 and 1827 failed."

REELING.

We have now arrived at a branch of the culture of the most vital importance to the success of the whole, and we feel especially solicitous to lay before the reader a frank exposition upon this head. It is the *supposed* difficulty of reeling that has hitherto deterred hundreds from entering into the business, and, indeed, to that cause, together with the want of a *market*, may be ascribed the snail-like march it has hitherto made towards being adopted as a component part of the husbandry of the country. Much difficulty too has been experienced in the obtainment of *reels*. This latter cause, however, has ceased to exist, as reels of the most simple structure are now to be had at moderate prices, and a knowledge of the use of these is so easy of acquisition, as to have stript this particular part of the culture of all the repulsiveness with which it was formerly surrounded.—Those who enter into the business with a view of prosecuting it on a large scale and of combining the manufacture of silk with it, will not need to be instructed; but the farmer or planter who may have entered into it merely as a branch of his system of husbandry, will require to be inducted into the mode of preparing his silk for market. And we would advise all such to submit their cocoons to the process of reeling, because in so doing they will impart a greatly *enhanced* value to the article, and we would especially recommend them so to do, as the requisite labor may all be performed by the *females* of their respective families, who will be enabled through a labor no less interesting than useful, to greatly add to the aggregate amount of the productions of the country, and instead of being burthens upon those upon whom they may be dependent, will become at once among the most profitable branches of every farming establishment. Nor is the labor of reeling the less valuable, because it can be performed at periods of leisure; but as we would advise in almost every other matter, so in this, the cocoons should be reeled as speedily as possible, and especially those that are defective, as they will deteriorate by being permitted to remain unwound for any length of time.

Before we enter upon the description of the process of reeling, we would re-

spectfully offer a word of *advice* to each and every person who may contemplate entering into the business. It is this:

Those who may commence the silk business as a branch of their respective systems of husbandry, after having sown their mulberry seed, should procure a small quantity of silk worm eggs, with which we advise, that they should practice upon our instructions. Should they do so, this good will result from it—by the time their orchards of mulberry are fit to feed from, they will have become perfect masters of the management of the worms, the cocoons, and the method of reeling the silk. If we are asked, where they will get the *leaves* from with which to feed the worms, we answer, in most cases, even the first year, they will be able to abstract a sufficieney of leaves from the mulberry plants, without injury to them, to feed the few worms neccssary to be fed as a *school*. Five hundred or a thousand eggs would be sufficient to commence with, and these could be afterwards multiplied, so that, by the time the orchards were of sufficient age for stripping, the party might have the requisite number of eggs on hand, without further cost, to feed all the leaves he might raise. The intelligent reader will discover at a single glance the object we have in view, and will doubtless improve upon our suggestion. Our anxiety to get our countrymen to enter liberally into this culture, arises from the honest conviction entertained by us, that it is more profitable than any thing else within the range of the agricultural calling, and because we behold in it the certain means of employment to the thousands and tens of thousands of destitute females, who are now dragging out a precarious livelihood throughout our wide spread country, and because we also behold in it, an antidote for that spirit of desolating emigration, which is driving the honest and enterprising from the haunts of their youth, to distant lands, and depopulating the members of that gallant confederacy, which achieved our freedom. Thus influenced, it will be readily perceived, we were solicitous that success should attend those who should be induced to adventure in the silk culture, and hence it is, we advise all to acquire a thorough knowledge of the art, by practising in the way we recommended—a way which, while it embodies every advantage of a school of experiment, comparatively costs nothing.

METHOD OF REELING.

A person charged with the business of reeling the cocoons, whom we will suppose to be a woman, must be provided with a basin of soft, hot water, to be kept at the proper heat, by being placed upon a small earthen or iron furnace, containing burning charcoal; she must have a small whisk of broom corn, or of birch twigs, cut sharp at the points, and being seated behind the basin, she must throw into the water a handful or two of cocoons of the same quality; press them gently under the water for two or three minutes, in order to soften the gum of the silk, and thereby to loosen the ends of the filaments; she is then to stir the cocoons with the end of the whisk or birchen rods, as lightly as possible, *barely* touching the cocoons, as should they be roughly struck, the fibres of the silk instead of coming off singly, will cling together in lumps, which prevents it from winding off. She will continue the stirring until one of the fibres or filaments adheres to it, when disengaging it, and laying aside the whisk, she is to draw the filaments towards her, until they come off quite clean from the floss or coarse silk, which always surrounds the cocoon, and the fine silk begins to appear: then, breaking off the thread and collecting the floss first taken off, she will run the thread through one of the holes in the iron plate, and proceed to get, and attach, others in a similar way, until a sufficient number is obtained to make the thread of the required firmness; a second thread is formed the same way, and passed through the adjoining hole: the two threads are then crossed several times around each other, and the ends of each passed through the guide hooks of the traversing bar, and on the contrary side of the hole in the iron plate,

through which it had been previously passed. They are then to be carried from, and made fast to, one of the arms of the reel. The points of attachment of the two threads will be regulated by the reeler, who should have smooth fingers, as roughness of the skin will cause great embarrassment. If, therefore, the skin of the reeler's fingers be rough, they should be rendered smooth by being rubbed with sand-paper, or dog-fish skin. Both threads being fastended to the reel, it is to be turned with a regular and even motion; at first slowly, until the threads are found to run freely and easily. The crossing of the threads is essential to their perfection, and must not be omitted. The friction of the threads removes any inequalities and roughness upon them, and insures strength, uniform thickness, and cylindrical form, which would otherwise be flat.

As soon as the pods begin to give the thread freely, the reel is turned with a quicker motion. While the reel is turning, the spinner must continually add fresh fibres to each thread as fast as she can find the ends, not waiting till some of the number she began with are ended, because the internal fibres are much thinner than those constituting the external layers; but must constantly prepare fresh ends, by dipping the whisk among fresh cocoons, of which such a quantity must be occasionally thrown into the basin as will suffice to supply the two threads which are reeling, but not more; because by being too long soaked in the hot water, they would wind off in burrs. The cocoons thrown in, must be often forced under the water, that they may be equally soaked. The supplying fresh ends, is a business which every woman who can spin will fully understand; she will know, when the cocoon is exhausted, or its fibres break, she must take the end of another fibre and throw it lightly on the one that is winding, and roll them between the thumb and the finger, gently pressing them together, so as to cause a juncture of the threads. The adroitness in adding fresh threads can only be acquired by practice; but by proper attention, that peculiar *tact*, so necessary to success, can easily be acquired.

If the pods leap up often, the motion of the wheel must be slackened, and if the threads come off in burrs, it must be turned quicker. Of this, the spinner, who has her eyes upon the balls and thread, must, as she sees occasion, apprise the reeler, and at the same time, the fire must be increased or diminished, that the reel be allowed a proper motion, which ought to be as quick as possible without endangering the breaking of the thread, or hurrying the spinner, so that she cannot add fresh cocoons as fast as the old ones are ended. The quicker the motion of the wheel is the better the silk winds off, and the better the end joins to the thread.

Every care must be observed to avoid the beraking of the whole thread or single fibres, as every such occurrence greatly retards the operation.

In preparing *fine silk*, in Cevennes, a famous silk district of France, the cocoons are not wound off entirely, so as to leave the pellicle of the chrysalis bare; first, because the additional fibres required to be added, when the first and strong part of the fibre is observed to be spent, might make the compound thread too stout, and would thus cause a waste of silk; secondly, because the fibre of a cocoon which has been entirely wound off, besides being weak, also abounds in knots, which would cause it to break in winding, and injure its uniformity, in which the goodness of the thread mainly consists. Therefore, in winding fine silk, when the cocoon has given off three-fourths and a half of silk, it must be replaced by another cocoon; the remainder of the first cocoons are to be set aside, and their silk added to that of an inferior quality. When the first parcel of cocoons is nearly finished, take out with a ladle all those on which some silk has been left; let them be opened, the chrysalids taken out, and the shells put in a basket, with the coarse fibres, first pulled off with the hands from the cocoons, which were ordered to be laid aside. These cocoons which are partly wound off, must on no

account be permitted to remain in the basin; for they will obscure and thicken the water, and injure the color and lustre of the silk, which can then be used only for dark colors; besides this, the consistence of the silk is injured, and waste ensues in the winding. The shells must be added to the manure heap; and as a general rule, it may be laid down as essential, that the water in the basin must be changed whenever it becomes discolored.

The softest water must always be chosen for reeling of the silk, and although its precise temperature cannot be laid down, because that, in a great measure, must depend upon the composition of the silk of the cocoons, which cannot be ascertained until the reeling has commenced. Such is the difference in cocoons that while some can be reeled from water heated from 160° and indeed less, others will require a temperature of 200. Some point between 150 and 190 is probably the right one, but what that point is can easily be ascertained, as whenever the cocoons yield *freely*, it will have been found, and the heat of the water should be maintained at it. By immersing the thermometer in the water at any time, the precise required heat can be detained, and may be preserved at that by submitting the water repeatedly to the test of the instrument. The water should never exceed 200°, and never that or any thing like it, unless absolutely required by the condition of the cocoons, and in order to arrive at the exact heat wanted, the increase should be gradually carried forward. There is no mystery at arriving at this point—all that is requisite is attention: with this the person engaged in reeling will be able to graduate the temperature without the least difficulty.

When the spent cocoons leap up and adhere to the iron plate, they must be immediately taken away, else by choking the passage, they will endanger the breaking of the thread.

When the reel has remained any time idle, the thread between the basin and the wires or vampins, must be wet to cause the thread to run easily. Keep also the teeth of the wheels, and the mortises in which the traversing bar plays, wet, to ensure regularity and ease to their movements. In winding the good cocoons, some defective ones will be found among them, which will not wind off, or are full of knots. These must be taken out of the copper, and be kept by themselves; they are called bassinats, and are to be wound apart as coarse as possible: they make a foul silk.

The breaking of the fibres is principally owing either to bad cocoons, viz: during their spinning:—or the fibres may break by an improper regulation of heat in the water: first, when it is not sufficient to make them wind off easy; or second, when it is too great, and occasions burrs, which may stop at some of the holes through which the thread runs. Cocoons also which have two worms enclosed, will perpetually break. The whole thread may also break, by burrs stopping at the holes of the plate or by the reels being turned by jerks. It may be fastened to the fibres, by laying the parts on one another, and giving them a little twist. To avoid the breaking, occasioned by burrs, the vampins should be just so wide as to let them easily pass.

It would be convenient for the spinner to have a little stick erected close to the side of the basin, to hang her whisk on, and also a sharp fork, with which she may draw away the spent cocoons, or such as being near spent, stick in the hole in the plate; and as the whisk will frequently take up more ends than are immediately to be added, and as the spinner will sometimes have occasion to employ both her hands, the brush will, at that time, conveniently hang by the basin, while the cocoons, which are attached to it, remain in the water, and the ends will be in readiness as they are wanted. When the cocoons rise to the iron plate, they are to be drawn down between the fingers of the spread hand.

If the spinner be under the necessity of leaving off work for any length of

time, the cocoons should all be raised with a skimmer out of the water, till her return, otherwise by oversoaking they would run off in burrs; but it is best to continue the reeling without interruption, and let fresh, but equally experienced persons succeed those who are tired.

As the heat of the water of the basin will require to be varied according to the ease or difficulty with which the different sorts of cocoons give off their silk, the spinner should always have some cold water within reach, in order to cool that in the basin quickly, when the silk comes off too easily and in burrs. The water is also necessary for the woman managing the cocoons, to cool her fingers, and to sprinkle the iron bar when it becomes heated. Some light wood, chips or shavings, should also be at hand to increase the heat quickly when the cocoons do not yield their silk readily. The water in which the cocoons are heated must be pure, soft and clear of sand or settlings.

When the cocoons are first put in the water, if the silk rises thick upon the brush, or gets in lumps, it is a sign the water is too hot: if the thread cannot be caught, the water is too cold. When the cocoons are in play, if they rise often to the holes in the iron plate, the water is too hot; if the cocoon do not follow the threads, it is too cold.

Keep an equal number of cocoons working at each end of the basin in order to preserve the thread of silk to an equal size. When there are fewer on one side than the other, the silk becomes smaller at that side, and the thread will break. Therefore, throw in the cocoons one by one, and never throw two at a time.

It will be seen by observing the position of the thread upon the reel, that the different layers do not lie parallel to, nor upon, but across one another. This is owing to the mechanism of the apparatus, and is particularly contrived to effect this object; which is essential to the perfection of the process, and one to which the acknowledged superiority of the Italian silk is to be ascribed. It is effected by the seesaw or horizontal motion of the traversing bar, and is produced by the different number of the teeth in the pinion of the axle, and in the wheels at the ends of the shaft, and in the pinions on the top of the post, which catch and work upon one another. Without this crossing, the threads, from their gummy nature, would inevitably adhere, and render the subsequent windings and twisting of the silk very difficult; causing the threads frequently to break, and when jointed to form knots, which, in weaving, cannot pass through the reeds, and hence injure the beauty of the stuffs. But the mechanism mentioned of the traversing bar, prevents the threads lying over each upon the other, upon the reel, until after it has made many revolutions. It is stated by *Borgnis* in the *Traite de Mechanique*, that the silk fibres of the cocoons are spun in zigzags, like those formed by the silk reel, and, consequently, the operation of the reel is an imitation of nature, of which the industry of the catterpillar, instructed by her, is the prototype.

Count *Dandolo*, says, that it is a well known fact, that of two reelers, each reeling 7½ pounds of cocoons of the same quality, one will obtain only six ounces and a half, or, perhaps still less, while another will turn off eight ounces.

A woman experienced in the business, with a girl to turn the wheel and attend the fire under the cauldron, can, with ease, reel off one pound of silk per day, consisting of four or five cocoons of the most perfect quality.

When a desired quantity of silk has been wound on the reel, pick off all the loose silk; then take a little handful of the coarse silk, and after washing and squeezing it, dip it in cold water, and rub over the silk on the reel, stroking up also the silk with the palm of the hand; then turn the wheel with all possible velocity, with open windows, if the reeling has been done in a room, for eight or ten minutes to dry the silk effectually; which done, take it off the reel, put it in a dry airy place, but not in the sun. This is done to clear the silk and give it a gloss.

When one reel is taken off, another should be put on, that the work may not be delayed. Every winding apparatus must have two reels.

In preparing the dupions for winding off, more are put into the basin at once than of the finest kind. They must be first well cleaned from the floss on their outsides. The water also must be boiling hot; and as the silk they yield is of a coarser quality than the other, and has a good deal of the floss upon it, the person who turns the reel must take the opportunity, while the one who manages the basin is preparing the cocoons for winding, to clear and pick off the loose silk from that which is on the reel. The *dupions* intended for ordinary sewing silk, are to be wound from 15 to 20 cocoons. The rest may be wound as coarse as possible, that is, from 40 to 50 cocoons. These serve to cover and fill up in coarse stuffs, and are likewise for sewing silk. The *good* choquettes are to be wound according to the uses they are intended to be put to, but not finer than from seven to eight. The *bad choquettes* may be wound from 15 to 20. The *satin cocoons*, so called from their resemblance to satin, require water only moderately hot. The proper heat will be found by observing the manner in which the silk comes off from the first of them which are put into the basin; and, as already said of cocoons generally, if it come off thick, cold water must be added, until the proper temperature be attained. They must not be allowed to remain long in the water, and there should be only a few of these cocoons put in at a time. The water for the *dupions* and choquettes must be changed four times a day.

It may, perhaps, be profitable to give the views of others, upon this particular branch of the business, as it is the process of reeling which imparts so much to the value of the silk. If done indifferently it may not be worth more than *four dollars* per pound; but if *well* and *skilfully* executed, it may be worth from *six* to *seven dollars* per pound, according to the demand and state of the market.

Loudon says:

"The cocoons, or product of the worms, as soon as complete, are either reeled off or sold to others to be reeled. The silk as formed by the worms is so fine, that if each ball or cocoon was reeled separately, it would be entirely unfit for the purposes of the manufacturer. In the reeling, therefore, after the cocoons are cleared from the floss, the ends of several are joined and reeled together out of warm water, which softening their natural gum, makes them stick together so as to form one strong smooth thread. As often as any single thread breaks or comes to an end, it is supplied by a new one, so that by continually keeping up the same number, the united threads may be wound to any length. The single threads of the newly added cocoons are not joined by any tie, but simply laid on the main thread, to which they adhere by their gum; and their ends are so fine as not to cause the least perceptible unevenness in the places where they are laid on. Care should be taken in the operation that the silk when reeled off may consist of a smooth thread of equal thickness and strength; but of a round form, having the small threads of which it is composed as equally stretched and firmly united as possible, and that the several rounds as they lie on the reel should not be glued together. When the skein is quite dry it is taken off the reel, and a tie is made with some of the refuse silk on that part of the skein where it bore upon the bar of the reel, and another tie on the opposite part of the skein, after which it is doubled into a hank, and usually tied round near the extremities, when it is laid by for use or sale."

Mr. *Kenrick* in his *Silk Grower's Guide*, states that "the use of the reel requires dexterity and practice. The cocoons, after being cleared of the floss, and thrown by handsful into basins of pure soft water, are placed over small furnaces of charcoal. When the water is almost at boiling point, sink the cocoons with a

whisk of broom corn under water for two or three minutes, to soften the gum and loosen the fibres. Then moving the whisk lightly, the filaments will adhere to it, and may be drawn off till the flossy silk is unwound, and the fine silk comes off. A sufficient number being collected, the reeling begins. If the pods leap upwards, the reel must be slackened; if the silk comes off in burrs, you must turn faster; if the water is too hot, they furze in unwinding, and the fine lustre of white silk is injured, and cold water must be added. It requires long practice dexterously to attend to the splicing on the fibres, to keep up an even thread, as the silk grows continually finer to the end of the cocoons."

Mr. *Cobb*, a practical culturist and extensive manufacturer, gives the following as the method of reeling cocoons and manufacturing silk in Connecticut. "A large kettle set in a furnace, or in an arch, is filled with water, and fire is kept under it; and when it is about to boil, a quart of cocoons is thrown into it," &c.; and after describing other preparatory measures, he says,—"Reeling is then commenced on a common hand reel (such as is in common use in families in New England for reeling yarn from the spinning wheel,) and the silk fibres run off about as fast and with as little difficulty as yarn from a spindle. Some of the cocoons run off before others, and when on this account the thread becomes too small, all the fibres are broken off, and what is reeled is tied up by itself on the reel, and another quart is then thrown into the kettle; the ends are collected and reeled in the same way as before, and each separate piece is tied by itself. When the reel is full, the pieces are all tied together, taken off, and immediately dried."

"Most of the silk is manufactured into sewing silk, and twist, in the following manner: it is immersed for a few moments in boiling water, taken out, put on swifts and spun or twisted on a common wool wheel, beginning at a large end of the piece, that is, at the end which was reeled first; and when it becomes too small, which is the case when one-half or two thirds is run off, the small end of another piece is added to it, and thus they are twisted together. It is then spooled directly off the spindle, a sufficient number of spools is put into a small spool frame to make thread of a proper size, which is twisted again and cleansed by boiling in strong suds for three hours, then dried and colored. Undergoing this process it shrinks about one-half in weight; after this, for sewing silk, it is doubled, twisted and reeled on a reel two yards long, and is divided into skeins of 20 threads each, as the statute of the state requires. If it be calculated for twist, it is then made three threaded, twisted, and done up into sticks with a small hand machine, and is then ready for the market. The floss, or tow, as it is called, is boiled in strong suds for three hours, dried, picked, carded, and spun on a common wool wheel. The yarn is woven into cloth, usually worn by the women for every day growns; and sometimes manufactured into strong and durable carpets.

Those cocoons that the grubs have pierced are boiled as above directed; the end that is not pierced is cut off; they are then spun on a *linen wheel* like worsted, beginning at the end cut. It is then twisted together, three threaded, and knit into stockings.

The imperfect cocoons, and all that will not reel, are boiled, carded, spun and manufactured in all respects like floss, but they make nicer and finer cloth."

During the last winter, Mr. *Adam Brooks*, of *Scituate*, *Massachusetts*, being in Baltimore, we availed ourself of his presence, and got him to take his reeling machine to our residence, a few miles distant, to test the facility by which persons wholly unacquainted with its use might be instructed, and we were astonished to find, that in about half a day, our wife, and eldest son, a youth then about thirteen years of age, both so far become initiated in the *mysteries* of fabricating sewing silks, as to be able to make a very good article. From what we then saw,

we believe, that any intelligent woman, girl, or boy, may be taught to make good sewing silk on one of Brooks' machines in a few hours. And we do but sheer justice to Mr. Brooks, when we say, that this machine is no less simple than efficient, and that there is so little intricacy about its management that one woman with two small boys, or girls, to turn it, can manage two machines, *each* of which is competent to *make from the cocoons*, ⅔ lb. of sewing silk per day. The value of the labor may be estimated, when we tell the reader that by the process from $3 to $7 additional value may be given to the silk, according to the degree of skill with which it may be converted into sewings.

We have been thus full upon this part of the subject, for the reasons before assigned by us, that it is by means of the reeling, &c. that a large portion of the profit of the culture arises. Indeed it may be said that those who are now engaged in the culture of silk, have to look to it for fully 50 per cent. of their profit, and hence it becomes doubly important that it should be well done.

MODE OF MAKING SEWING SILK, AND SILK TWIST IN CONNECTICUT.

The following is the method followed in Connecticut, as recommended to the secretary of the Treasury by Daniel Bulkley, Esquire.

"The raw silk is spooled on bobbins, the number of which is in proportion to the size of the intended thread from the first spinning, and, to facilitate the operation, they are put into warm water. The silk is again spooled, taking two or three bobbins, according to the size of the intended thread. After being spun, it is reeled into skeins, each of forty yards in length, or half a knot of the country reel, as required by a law of the state. About twenty-five of these skeins are put together like a skein of cotton or woollen yarn. They are then boiled, adding a small quantity of soft soap, or ley of wood ashes, to cleanse them from the gum; they are then ready for dying.

Silk twist is spun in the same manner, except that it is always of three cords. The winding of twist is done on a machine imported from England.

We have a small establishment for spinning by water, with a machine similar to a throstle frame of a cotton mill. The silk is first spooled by hand on bobbins, which are placed on the top of the frame; the thread of raw silk passing from it under a wire through a trough of water, then through rollers to a spindle. A single frame may contain from thirty to fifty spindles, and can be attended to by one person. The doubling and twisting may be done by the same frame at the same time, by giving the bands to a part of the spindles of a contrary direction. As many threads are put to a spindle as are required to make a thread of two or three cords. Silk spun in this way is far superior to that done by hand. The machine will spin from two to three pounds in a day. A pound of silk after being spun and cleansed will weigh about ten ounces, and form one hundred and seventy skeins; the threads of sufficient size to sew woollens. If spun finer, it would make more. It increases little or nothing in weight when dyed. Silk is sold by the skein; one hundred of which will measure one-third more than half a pound of Italian, or English silk, of the same sized threads. One woman can make from twelve to fifteen pounds of raw silk, in a season of six weeks."

PREPARATION OF WASTE SILK.

"All the cocoons pierced by the moths; those formed with holes at one or both ends; the light cocoons deemed improper for winding, after the insects have been cut out, or threshed out, and the pellicles remaining after winding of the silk, are to be collected; and if it be wished to retain the yellow color, they are put in a copper kettle with water, and trampled with the feet; turning the cocoons, and adding a little fresh water from time to time, until it be found that the silk separates properly, upon tedding it out with the fingers. They are then tied up

in a clean cloth, which is dipped in a clear stream, or water is poured on them, until it runs off without color, and spread out to dry."

WASTE WHITE SILK.

"Waste silk intended to remain white, is to be traated in the following manner:

Put the cocoons in a kettle of cold water, and let them lie 24 hours: then boil them in a copper kettle, adding a quarter of a pound of soap for every pound of cocoons: when the soap is dissolved, tie up the cocoons in a clean cloth, put it in a kettle, and boil until the cocoons have become white. The water should entirely cover the cloth; then take out the cloth, and dip it in a clean stream, or pour water on it till it comes off clear; then spread out the cocoons in the sun to dry.

ON SPINNING INFERIOR QUALITIES OF SILK.

In every filature, one or more reels are devoted to the spinning with the carrelet, the inferior qualities of silk, which cannot be spun on the common reel. The carrelet, is thus described by *M. Reynauld*, of Paris. The frame is larger than the common silk reel, and has commonly a wheel with four arms. The most essential difference in the frames, is that of the head pieces. To these are added a board which carries two or four bobbins. If there are only two, they are placed longitudinally one above the other. If two threads are to be wound at a time, two other bobbins are added, and placed between the other two in the same position. After the cocoons have been threshed, a number of the fibres are collected to form a thread, which is passed through one of the two eyes of the board of the bobbins, of the same form as that of the traversing bar of the silk reel; then it is wound round both bobbins at the same time; being first carried to the first and returning round the second, it passes between them, giving a twist to a part of the fibre which was extended from one bobbin to the other. The spinner then takes the same end, and passes it through the eye of the traversing bar, and attaching it to the wheel, it is set in motion. If it be wished to wind two skeins at one time, a second thread is prepared, and attached to the second pair of cylinders or bobbins, whence it passed through the second eye of the traversing bar, and then fixed to the wheel at a proper distance from the first end.

The silk called *fram*, which is slightly twisted, and used for the filling of stuffs and for inferior silk for bonnets; the *dupions* or double cocoons, are also reeled on the carrelet in France. These latter require softening in hot water five or six minutes.

In *France*, the coarse fibres taken off the cocoons and laid aside, are called *fantasie;* it is first boiled, then carded and spun: the best of it is used for filling after being slightly twisted, and the inferior for the chain of stuffs. In *Connecticut*, the coarse thread of the cocoons are made into a ball, then reeled, boiled in soap and water, rinsed, dried, cut into one and a half inch pieces, then carded on cotton cards, and spun like wool or cotton.

The pointed cocoons, or such imperfect ones, as are made by feeble worms, or in cold seasons, when the temperature of the apartment is not attended to, are first deprived of their gum, by being immersed in water, or soap and water, dried, and then spun upon the wheel, and forms an even and fine thread.

In *Connecticut*, family sewing silk is made from the good cocoons, from which the moths have escaped. The shrivelled case of the pupa, and any eggs which may have been deposited in the cocoon, are first taken out; they are then boiled in soap and water, rinsed, gently squeezed, dried, and spun on a foot wheel.—Knitting thread for stockings and mits, is also made from them. They make the best sewing silk, by doubling the thread, reeled from cocoons, and twisting it on the common wheel. The skein is first boiled in soap and water, and it lies on a

dish containing enough soap-suds to keep it moist, while the process of reeling is going on.

To organzine silk.—The thread is first twisted from right to left. The silk in twisting, turns off on other bobbins somewhat larger than the first. These bobbins are then to be exposed to the stream of water, to which have been added two ounces of white, or castile soap, (the latter best,) 18 ounces of olive oil, and four or five pounds of wood ashes. The bobbins are put in a kettle, the bottom of which is pierced, and placed on the vessel of water, when its boils with a cloth over it, and permitted to remain until the silk begins to swell, and to detach from the bobbins. They are then to be taken away, and the second throw or twist given to the threads, from left to right. The combination of these two threads, is called the *pearl*, as the organzine looks like a string of small pearls or beads. It is easy to know if the second throw be perfect, by untwisting part of the organzine, and when it is open, or slackening the hand a little, each thread twists round itself in obedience to the first throw or twist. The water may be filled up as it wastes, but the ashes, soap and oil, are to be renewed every day.

MACHINERY.

It is not our purpose to give minute descriptions of the various reels, looms, and other machinery used in the preparation and manufacture of silk. Such an occupation of our pages, we deem wholly unnecessary, because it is not to be presumed that farmers will desire to become manufacturers of such implements, and, indeed, if they were so disposed, the immunities of the patent law would prevent them. We shall, therefore, content ourself with enumerating such of the most prominent inventions, as appear to us, by their merit, to demand notice. Indeed, more than this, in the present state of improvement, when the spirit of emulation is emphatically abroad, would be worse than supererogatory. Any individual entering into the silk culture, will, as a matter of sheer prudence, in the exercise of a sound discrimination, procure for himself the best of all such machinery as he may require to carry on such branches of the business, as it may be his peculiar pleasure to engage in; and with respect to the prosecution of the business by manufacturing companies, they will not require to be reminded of what particular kinds of machinery, or implements, they will need; their interest will at once dictate the procurement of such as is best adapted to the uses, to which they intend to appropriate them.

The brief notice below will suffice for all profitable uses of the farmer or planter:

1. The silk reel, of Piedmont.

2. *Gideon B. Smith's* improved silk reel—being an improvement upon the above, the operation being greatly simplified.

3. *Brooks' patent silk spinning and reeling machine.*—This is represented as being a very simple and easy operating machine, and yet one of the most perfect that has been invented for the purpose of reeling and twisting silk from the cocoons, and manufacturing it into sewing silk.

4. *Gay and Mosely's reel, and silk power loom.*—The following description of the latter improved machinery, we copy from that excellent and sensibly conducted periodical, "*The Silk Worm*," published at Albany, New York, and edited by Samuel Blydenburgh, Esq.

'By the improved system of winding silk, invented by Mr. *Gay*, many and important advantages are gained; but still it will not altogether supercede the use of the reel. By his plan the silk is wound on spools from the cocoons. In this state it is not liable to tangle as when in skeins. When once wound in a contiguous thread on the spools, it may be kept any length of time, and carried any distance, without injury. It will be in the same state of keeping, as the spools of cotton thread, and may always be wound off in the same entire thread as it

was wound on. When the silk is intended to be sold to the manufacturer, or even to the merchant, this is infinitely the safest way in which it can be preserved. When in the skein it is always liable to injuries, either in keeping or in transportation.

If the silk is cultivated near to where it is to be manufactured, the manufacturer can furnish the spools, weighing them as they are delivered out, and deducting the weight of the spools when returned from the silk. If it is to go through several hands, the spool may be made of an exact given weight, and warranted not to weigh more.

The whole process of winding is, by this plan, not rendered much more simple, and easy to learn, but is infinitely more convenient, as it will be done by a little snug machine, which will be no inconvenience at the fireside, while the regular silk reel is much more cumbrous, and would scarcely find room in a small dwelling.

But in nearly all cases, where the silk is to be manufactured, it will still have to be reeled from these bobbins, or spools, into hanks or skeins. This, however, is no objection to winding it originally on spools, for the saving and other advantages which result from keeping and preserving the silk on spools, overbalance the trouble of two windings."

☞We take pleasure in stating, that these machines may be obtained on application to *Samuel Blydenburgh*, Esq. Albany, New York, or of G. Gay, Dover, Delaware.

Speaking of the machinery of Mr. Gay and his partner, Mr. Mosely, Judge *Ambrose Spencer*, of Albany, New York, in a letter to Mr. A. H. Brown, of Frederick county, Md. makes the following remarks, which, through the politeness of the latter gentleman, we are permitted to copy:

"I am personally acquainted with Mr. Gay: he is, indeed, a very ingenious man; independent of the *reel* invented by him and Mosely, he, or they, have simplified all the machinery necessary for the manufacture of silk, and there is now in operation at Providence, under Mr. Gay's direction, a manufactory of silk, the stock of which has sold for more than 100 per cent. advance. He sent me a pattern for a vest, equal to any imported. He finds that the power loom, by which cotton has been woven, may be successfully used for the weaving of silk. Mr. Gay is the very man to give or furnish instruction in the art of *reeling*, and to establish a manufactory, furnishing all the necessary machinery."

And in addition to this high encomium upon the merits of Mr. Gay and his machinery, we have seen it stated, that his *reel* is so simple in its construction, as that any woman can acquire sufficient knowledge of its use in two hours instruction, to become a tolerably expert reeler.

5. *Terhoeven's winding, doubling and twisting machine.*—This is represented as a simple machine, invented by Messrs. Terhoevens, of Philadelphia, used for winding silk from cocoons, and for doubling and twisting the thread at the same time.

6. *Cobb's reel.*—This is an invention of Mr. J. H. Cobb, of Massachusetts, and it is stated to be a most efficient machine, combining in an eminent degree simplicity with power.

There are many other reeling machines, of European and American inventions, as well as numerous silk looms, twisting machines, draw boys, ribbon looms, looms for weaving plain and figured stuffs, and power and other looms, and inventions, of one kind or another, out of number, but as our work is intended for farmers and planters, who, we presume, will scarcely ever carry the business beyond converting the cocoons into raw silk, we consider that, in noticing the machines herein recited, we have accomplished all that need be required by those for whose accommodation we have ventured to compile this work. Indeed, so far as the

interests of the husbandman is concerned, except for the purposes of domestic use, such as sewing silk, knitting of stockings, and the fabrication of an occasional dress for the females of the family, we should doubt the propriety of his carrying the silk culture beyond the point of reeling. Having effected that, we think, he should be content to transfer the business of all subsequent labor upon the commodity, to the hands of the manufacturer, leaving his *factor* to settle the questions with respect to who *that* should be, or whether he should find for it a foreign or domestic market.

MARKET FOR THE SILK.

The disposal of the silk after it shall have been raised, being an object of the first importance, it seems opportune that we should say a word or two with respect to the markets. By a letter of Judge *Ambrose Spencer*, it is stated, that the import of silk amounts to the value of $10,000,000, *annually*, and as he very justly remarks, this will increase with our wealth and population. Thus we have a domestic market, to this enormous amount, inviting the American husbandman to supply it. And already various manufactories in the states of New York, Rhode Island, Connecticut, and Massachusetts, have been established, to convert the raw silk into stuffs of various descriptions, and so confident are the calculating people of that intelligent and enterprising portion of our country, of the entire and triumphant success of the silk business, that companies and individuals are in every direction of it, entering with spirit into the culture and manufacture of silk. Indeed, so rapidly have been the multiplication of establishments for its manufacture, that the *demand* for the raw material, greatly exceeds the supply, *and at the present moment almost any quantity of cocoons or raw silk, would find a ready and profitable market*, in any of the principal eastern cities. The price of raw silk, we have seen quoted at $4 per pound, and that of *cocoons* at $3 a bushel. We have never counted the number of cocoons contained in a bushel; but from having measured and counted a quart, we should think that from 4,000 to 5,000, according to their size and perfection, would make a bushel of cocoons. The only thing like a calculation upon this part of the subject, that we have been able to lay our hands upon, we found in the very interesting letter of *William B. Buchanan*, Esq., in which he speaks of 1,500 worms making *about three pecks of cocoons*. If *his measure* be a correct one, then, two thousand would make a bushel, but we incline to think that an *average*, of any *considerable quantity*, would take fully the number assumed by us.

Besides the domestic market just spoken of, *France imports* annually between $5,000,000 and $6,000,000 worth of raw silk, and this, too, notwithstanding she is a silk growing country. And *England*, owing to the humidity of her climate, being unable to raise the worms to advantage, has to draw all the raw material for her numerous silk manufactories, from distant countries, and we have seen the annual average amount consumed by them from 1821 to 1828, a period of seven years, stated at $17,255,368. Thus then, in our home market, and in the markets of France and England, we find a demand for raw silk, annually, of about $33,000,000, which, as those countries respectively expand in population and wealth, must increase in a correspondent ratio; and no one will pretend to affirm, that, if we supply the article upon as good terms as other nations, we will not have an equal chance with them in so doing. And here we would ask, what can prevent us, with our advantages of locality, of climate, extensive domains, and soil, from at once becoming successful rivals in every market where the raw silk material is demanded? There is nothing within the range of probability, that can operate unfavorably to our competition, unless, indeed, it be our own supineness—our culpable indifference—our criminal neglect—to add to our productions, a staple commodity, which will, if prosecuted with vigor and intelligence for ten years, equal, if it does not exceed, our exportation of cotton, with-

out interfering in the least with its consumption. As it has been forcibly observed by Judge Spencer, our *import* of *silk stuffs* already exceed our entire *export* of *bread stuffs*. This is an important fact, because with the facilities of manufacturing already established and being established, we have at our own doors, a market greatly exceeding in *demand* any *supply* which for several years the country will be able to furnish, and at prices too, which offer the most generous rewards to the labor of the agriculturist.

If it be said that the markets are to the *eastward*, remote from the great mulberry regions of the middle and southern states, we affirm that agencies for the purchase of raw silk, will rise up in every district and city of those regions, so soon as the article shall be grown therein in sufficient quantities to make it an object. Therefore, no farmer or planter should permit such a thought to enter his mind, as there is nothing more certain than that *markets* and *capital* will *spring* up, and be *employed* wherever and whenever profit is to be made,—interest and emolument, being with merchants, as with every body else, the great ruling motives by which their actions are governed in matters of trade.

DISBANDING OF SILK FROM THE REEL.

The Treasury Manual has the following, and as we see it copied by the Silk Culturist, published at Hartford, Connecticut, by the Hartford county Silk Society, in the midst of the silk culture country, we take it for granted that it is the approved method.

"The single fibres of which the thread is composed, are liable to suffer very different degrees of stretching as they are wound from the cocoons. If the cocoons are not well sorted, this different degree of extension will be the greater; and even when they are sorted, they must still be subject to the same, because some are a little longer in the water than others, and, therefore give their silk easier; and also, the weak latter ends of some cocoons wind off with the strong first part of others. The fibres being thus stretched unequally, will occasion when the skein is taken from the reel too suddenly, those fibres which are most stretched to contract more than the others, by which their union will be in some measure destroyed, and the thread composed of them rendered less compact and firm, the fibres appearing in several places disjoined from one another. To remedy this, the skein should remain there six or eight hours, until the unequal extension which it suffered in winding is, by the stretch which it undergoes on the reel, brought nearer to an equality; and, until the thread, by being well dried, has its fibres firmly united. When the skein is quite dry, proceed to disband it from the reel. First, squeeze it together all around, to loosen it upon the bars; then, with a thread made of the refuse silk, tie it on that place where it bore on the bars of the reel: then slide it off the reel, and make another tie on the part opposite to the one first made; after which, double it, and tie it near each extremity, and then lay it by for use or sale, in a dry place. When the skein is finished, there should be a mark tied to the end of the thread, otherwise it may be difficult to find it, if it mixes with the thread of the skein.

CLEANSING AND UNGUMMING SILK.

"The operation consists of depriving silk of the principles which affect its whiteness.

Make up the silk into hanks, that is to say, run a thread around each hank which consists of a certain quantity of skeins tied together. After that, the hanks are to be united, and several of them to be bound together, to make up a bundle, the sizes and names whereof vary according to the nature of the article manufactured.

After this operation, soap is to be dissolved in water, heated in a kettle in the proportion of 15 lbs. of soap to 100 lbs. of silk. Cut the soap into small slices to promote its solution. After the soap has been dissolved, the kettle is to be

filled with fresh water, which should be pure, free from calcareous impregnation, but not in unnecessary quantities, in order to avoid increasing the proportion of injurious salts, and weakening the force of the solvent. The proper proportions for this operation, as ascertained after many experiments on a large scale, are 7 or 8 lbs. of water, to 1 of silk—1-12 or 1-6 is sufficient for the greater number of colors: for yellow, unbleached silks, it is necessary to add from 50 to 60 per cent.; for unbleached white silks, 25 per cent. of soap. The water being in the kettle, the doors of the furnace closed, leaving only a few live coals in it, in order that the bath may be kept quite hot, but, without boiling; for Dr. Bancroft says, that silk ought never to be submitted to a boiling heat, either when the mordant is applied, or afterwards in the dying operation, as a high temperature, besides injuring the texture and lustre of the silk, would detach and separate the mordant, before the coloring matter could have combined, and produced an insoluble union with both. Those eminent French chemists, *Thenard* and *Roard*, also confirm Mr. Bancroft's views.

Whilst this bath is preparing, the hanks are to be put upon the pegs or pins, and when the bath is ready, the silk is to be put into it, and left therein, until all the part dipped is wholly freed from its gum; which will be easily seen, by the whiteness and flexibility which the silk acquires when deprived of it. The hanks are then placed again on the rods, to undergo the same operation in the parts not yet steeped; they are then to be taken out of the bath, in proportion as they are found divested of their gum.

The silk, thus ungummed, is to be wrung upon the pins to remove the soap in it; then to be dressed, by being arranged upon the pins and upon the hands, in order to disentangle it; then a cord is to be run through the hanks, to keep them down during the boiling. About eight or nine hanks may be placed on a line. After this the silks are to be put into bags of coarse strong linen. These bags are to be but fourteen or fifteen inches wide, and four or five feet long,—closed at both ends, but open lengthwise. When the silk is put in them they must be stitched up—each bag will hold 30 lbs. of silk.

The silk thus bagged is to be submitted to a similar soap bath, as above described, to undergo a boiling for a quarter of an hour; when it begins to boil over, it is to be checked by adding cold water. The bags during boiling must be often stirred to prevent the silk from burning. This operation is performed with silk intended to remain white.

BOILING SILK TO BE DYED WHITE.

For boiling silks intended for common colors, 20 lbs. of soap to 100 lbs. of raw silk. The process of boiling the same as the first described, with this difference only; that as the silk is not to be freed from its gum, the boiling is to be continued three hours and a half, taking care to fill up from time to time with water.

If the silks are intended to be dyed blue, or iron gray, sulphur, or other colors, which require to be set in a very deep white ground, in order to acquire the desired beauty, there are to be used 30 lbs. of soap to 100 lbs. of silk, and the boiling to be continued three or four hours. After being supposed to be boiled enough, let the bags be raised with a stick, placed on a frame, and examined if there be any parts where the liquid has not penetrated. This is easily ascertained by the yellow and a certain kind of slime remaining on those parts. Should this defect be discovered, the bags of silk must be again boiled until it be remedied. The loss in boiling is about one fourth in weight.

SULPHURING.

The silks to be sulphured, should be extended on poles, placed seven or eight feet from the ground, in a high apartment without a chimney, where the air may freely circulate by leaving the windows and door open. For every 100 lbs. of silk, take 1½ pounds of roll brimstone, put it into an earthen pan or iron kettle,

at the bottom of which a layer of ashes is to be placed; pound the rolls of brimstone coarsely; then set fire to it and smoke the silk during the night. The next day the door and windows are to be opened, to let the smell of the brimstone escape and dry the silk. If the silk should not thus be dried, apply live coals in chaffing dishes or some other convenience.

Aluming.—After having washed the silks, and divested them of the soap by giving them a boiling, pass a cord through them as when they are to be boiled; then take 50 lbs. of alum, for 50 buckets of water—(dissolve the alum first in hot water,) stir it well on emptying the solution of alum into the tub, and it will prevent congelation. This bath will answer for 150 lbs. of silk to be steeped in it until the solution begins to have a fetid smell. The silk should not be put in until it is perfectly cold. If the alum water should appear too weak, more alum is to be added.

PROCESS OF DYING.

A Handsome Yellow.—[Note.—The following receipts are proportioned to 10 lbs. of silk previously boiled.] Take 1¼ lb. of alum, 20 lbs. common Lady's (St. Mary's) Thistle, ½ lb. wood ashes: Dissolve the alum in a kettle containing ten buckets of water, pour the solution into a vat, fix your silk upon rods, in the usual way, steep it in the solution, work it well therein for an hour, take it out, and lay it aside wet, for further use.

This being done, put ten buckets of water in a kettle, add the St. Mary's Thistle, and boil it well for a quarter of an hour, run the decoction through it; let it cool, until you will be able to bear your hands in it, steep the silk in the liquor, work it well therein for half an hour; then take it out, wring it, and lay it aside, in its wet state, for further use.

The pails or vessels in which you dress the silk with alum, and in which the liquor is, must be filled, and kept full, during the process of working it, to within a few inches of the top; and, should there be occasion to fill up, or to increase the quantity of liquor with water, care must be taken not to make it too cool, but to preserve, at all times, a degree of heat, in which the hand can be barely held. While this is doing, the St. Mary's Thistle must be put into the kettle a second time, with fresh water, and be boiled again. Then take out the silk, dip out some of the liquor, in which you had previously worked the silk, and add as much of the liquor of the second boiling to it as was taken therefrom, so that the first quantity will be preserved. The liquor must now, as well as each time before you steep the silk in it, be stirred well; then steep the silk in the liquor again, and work it well therein for half an hour.

The liquor may, in this latter process, be made a little hotter than it was in the first; but be cautious not to make it too hot, as the silk would be considerably injured thereby.

During this second process, the wood ashes are to be dissolved in a kettle, into which you have procured some of the liquor of the second coloring, boiling hot; stir the liquor and wood ashes well, and then let it settle. This being done, pour some of the clear part of the solution into the yellow liquor, after having first taken out the silk, stir the whole of it well, steep the silk in it again, and work it well therein during fifteen minutes. At the expiration of this time, or sooner, as you may deem it necessary, take out a small quantity of the silk, wring it, and examine whether it has retained the required color; should this not be the case, a small quantity of the solution of wood ashes must be added to the liquor, the silk steeped in it again, and well worked in the same, until the required color be obtained.

A Citron Yellow.—Take 1¼ lb. of alum, 8 lbs. of safflour, ¼ lb. of alum; dissolve the alum in a kettle containing ten buckets of water; then pour the solution into a vat, steep the silk in it, work it well therein for half an hour, wring it,

lay it by in its wet state, for further use, and throw away the solution of alum as useless. Put again ten buckets of fresh water in the kettle, add eight pounds of safflour and ¼ lb. of alum, let it boil for half an hour, run the solution through a sieve into a vat, steep the silk in the liquor, work it well therein a quarter of an hour, wring and dry it, fix it on the wringing post, wring and beat it well.

With the rest of the above liquor, a pale yellow may yet be dyed.

A Citron Yellow, which may be heightened to a handsome gold tint.—Take 1¼ lb. of alum, 14 lbs. of safflour, ¼ lb. of alum; put ten buckets of water in a kettle, add one and a quarter pounds of alum, dissolve it therein, pour the solution into a vat, and work the silk in the solution for about half an hour, wring it, and lay it by in its wet state, for further use.

This being done, pour ten buckets of fresh water into the kettle, add seven pounds of safflour, and boil half an hour, pour the liquor through a sieve into a vat, and work it well therein for the space of fifteen minutes; then wring and dry it. The yellow liquor is now to be poured back into the kettle, the remaining seven pounds of the safflour to be put into it, together with a quarter of a pound of alum, and the whole to be boiled half an hour; then pour the liquor through a sieve into a pail, work the silk well in the liquor for half an hour, wring and dry it, and then beat it well. By the above process, a handsome citron yellow may be obtained.

A Citron Yellow, in a different way.—Take 1¼ lbs. of alum, 7 lbs. of French berries; put the alum into a kettle, with eight buckets of water; when dissolved, pour it into a bucket, immerse the silk in the solution, work it well therein for half an hour, take it out, and lay it aside for further use in its wet state, and throw away the solution. Then boil ten buckets of fresh water, put into it the French berries, boil it for three quarters of an hour, pour it through a sieve into a bucket, and immerse it in the liquor, work it well therein for half an hour, wring it, fix it on the wringing post in the usual manner. To make this color deeper or brighter, take more or less than the above quantity of the French berries.

If the liquor, after this process, still retains some of its yellow properties, it may be used to color ten pounds of silk, previously prepared in a solution of alum, to a pale yellow, or to lay at least the ground for a handsome gold tint.

A Citron Yellow, in another manner.—Take 2 lbs. of alum, 6 lbs. of Quercitron bark, ground; put the alum in a kettle, with ten buckets of fresh water, dissolve it therein, and pour the solution into a vat, immerse the silk in it, and work it well therein for two hours; wring it, lay it aside for further use, and throw away your solution of alum as useless. Then pour into a kettle ten buckets of fresh water, and put the ground Quercitron into it; boil this one hour, take it out, run the decoction through a sieve into a pail, immerse it into the liquor, and work it well an hour in the solution; after which it is to be taken out, wrung and dried; fix it on the wringing post, wring it again, &c., when it will have acquired a beautiful citron yellow. The remaining yellow liquor may be used for other purposes, and may therefore be preserved. I will now give the necessary direction for coloring a handsome pale yellow, with the above remains of the yellow liquor.

A Pale Yellow.—Take 2 lbs. of alum; prepare the silk with alum, as directed in the foregoing receipt, and lay it away for further use. Then warm the liquor, which has been used in the coloring of the foregoing operation; put it in a pail, immerse it into the liquor, and work it well therein, for the space of half an hour. This being done, take it out, wring it, fix it on the wringing post, wring and beat it well, which will give it a gloss. It is not necessary that silk should be rinsed in yellow coloring.

SEVERAL DIRECTIONS FOR DYING WITH QUERCITRON BARK.

A Citron Yellow.—Take 3 lbs. of alum, and 1 lb. of Quercitron bark; put the alum in a kettle, with ten buckets of water; let it dissolve therein, pour the solution into a pail, immerse the silk in the solution, and work it well therein, a little longer than usual; take it out, wring and rinse it, and lay it by for further use, in its wet state; put ten buckets of fresh water into a kettle, warm it, put the quercitron in a bag, and boil it until the strength is extracted. Then immerse the silk in the liquor, and work it well therein a quarter of an hour, which will produce a handsome lively citron yellow.

A high colored Yellow.—This color may be heightened to its utmost extent of yellow, by adding a few half ounces of soda, more or less, according to the deep bright shades of color desired, to the above yellow liquor; but this must not be done until the silk has been completely saturated with the yellow liquor of quercitron.

Orange color.—Orange color is obtained by adding the liquor at the same time with the soda, a proportional quantity of annatto, and by working it in this liquor until the desired color has been obtained.

Pale Yellow, or straw color.—Take less alum and quercitron, and dispense altogether with the soda and annatto.

Buff.—To produce the many different shades of this color, proceed with the quercitron in the same manner as directed in the dying of the same colors with turmeric and wild (dyer's) wood. But you must bear in mind that one pound of the quercitron, will produce as much as ten pounds of either the turmeric or wild.

A very lively glossy Yellow.—If you desire to increase the above yellow to its most lively and glossy hue, take instead of the alum, a solution of tin, dissolved in a mixture of three parts of the spirits of salt, and one part of aquafortis. This solution must be mixed with twenty times its own quantity of water, and the silk is to be prepared in a solution of alum, in the usual way; but it is not necessary to rinse it, and it may be colored immediately. The solution of tin may be preserved for other purposes.

A Turkish blue.—Take $2\frac{1}{2}$ ounces of cochineal, 10 ounces of aquafortis, $1\frac{1}{2}$ ounces of English tin and $\frac{1}{4}$ of an ounce of alum; the silk must first be colored in a deep, to a medium blue. This being done, take a kettle containing ten buckets of water, put into it two and a half ounces of cochineal, and boil it well for the space of ten minutes.

During the above process, dissolve the tin in the aquafortis, according to art. This being done, pour the solution, together with a quarter of a pound of alum, into the above mentioned kettle, with ten buckets of water. Stir the liquor well, and immerse the silk in the liquor, work it well therein, for about three quarters of an hour; during which time, it must be kept at a steady, slow, continued boil; then take it out, rinse it, fix it on the wringing post, wring and heat it well; which will restore it to its natural gloss again.

A real pink.—Take 15 lbs. of safflower, 15 quarts of strong vinegar, 3-8 of an ounce of oil of vitriol, 1 lb. 14 oz. potash, and 4 ounces of cream of tartar; put the 15 lbs. of safflower in a bag, tie it tight, immerse it forty eight hours in running water; take it out, during this time, every six hours; tread it well with your feet, to free it of all yellow matter; continue this until all the yellow matter has been worked out of it. Examine it at the expiration of the above time, to see whether it has lost all its coloring matter; if it has not, immerse it a few hours more in the water, which will clear it from all yellow matter.—This being done, take it out, put it into a pail, and pour six buckets of river water upon it.

This being done, put one pound fourteen ounces of potash in a crock, dissolve

it in water, and pour the clear part of the potash liquor on the safflower in the tub; mix it well, and set it by, in a cool place, for six hours. At the expiration of this time, take out the safflower with its liquor, run it through a sieve into a pail, pour half a bucket of water upon it, and press it out, in order to extract all the coloring matter therefrom; pour fifteen quarts of vinegar, and three-eighths of an ounce of oil of vitriol into the liquor.

This being done, take ten pounds of silk, fix it upon the rods, put it into the safflower liquor, and work it well therein, for the space of four hours; then take it out, rinse it in running water, wring it well, and lay it aside for further use, in its wet state.

Lastly. Dissolve four ounces of cream of tartar in river water, and pour the the clear part or this solution into a tub, with eight buckets of river water; immerse the silk, which has before been colored to a light red, in this solution, and work it well therein for quarter of an hour; take it out, wring it, and dry it, and you will have a handsome pink.

A high colored Crimson.—Take 1¼ lbs. of cochineal, 1 lb. of galls, 4 oz. cream of tartar, and 2½ lbs. Roman alum.—Dissolve 2½ lbs. of Roman alum in a kettle, with ten buckets of water; pour the clean part of this solution into a vat, immerse the silk in it, and work it well therein for the space of four hours; and rinse it in running water, wring it, and lay it by for further use, in its wet state; then put in a kettle containing eight buckets of boiling water, the following articles:

One and a quarter pounds of finely powdered cochineal, one pound of finely powdered gall-nuts, and four ounces of cream of tartar. Let the whole boil slowly, for the space of fifteen minutes; cool it with two buckets of water, work it well in the liquor, which must be kept in a continual boil for the space of one hour and a half; then take it out, rinse it, wring it, and let it dry, when the dying will be completed.

For a cheaper color than the foregoing, reduce the quantity of cochineal, from one and a quarter pounds, to ten ounces, and substitute for the remainder, three pound persio;* and proceed with these materials in the same manner as above directed. This color will differ from that of the first described process, in no other respect than that it receives somewhat more of a bluish cast.

A handsome Crimson.—Take 3 lbs. of Roman alum, ½ ounce of argol,† ½ lb. East India galls, 25 ounces of cochineal.—Heat eight buckets of rain water in a kettle lukewarm; put into it three pounds of Roman alum, dissolve it therein for the space of eight hours.

Take it out at the expiration of this time, wring it lighly, and lay it by for further use, in its wet state. To complete this color, heat eight buckets of well or spring water until it begins to boil; put into it the following articles: half an ounce of argol, and half a pound of finely powdered East India galls; let the whole of these articles boil well for about ten minutes, and run the liquor through a sieve, into a pail; then pour the liquor back into the kettle, and put into it twenty-five ounces of pulverized cochineal; let it boil ten minutes more, cool the liquor with half a bucket of water; immerse the silk in this liquor, and work it well therein for the space of two hours; during which time, the liquor must be kept at a continual boil. This being done, take it out, rinse well, wring it strongly, and dry it.

Then take a kettle, with ten buckets of spring or well water, and heat it so that you may bear your hand in it; work the silk well in this water for half an hour, then take it out, wring it, and dry it. By this process, we obtain a very handsome crimson.

*The cudbear of the English dyer. †Tartar from red wine.

A Deep Red.—Take 1 lb. of fine galls, 2½ lbs. of alum, ½ lb. of composition, and 5 lbs. of madder—put into a kettle eight buckets of water, and one pound of fine galls; let it boil about fifteen minutes, or until the strength is extracted; take it out, run it through a sieve into a vat, steep the silk in this decoction, and work it well therein for about two hours: after which take it out, rinse, and dry it. Then put into a kettle eight buckets of water, with two and a half pounds of alum, and a half pound of the composition; let these be properly united with the water; pour the liquor into a vat, steep the silk in the solution, and work it well therein for the space of four hours: take it out, rinse it, and lay it by in its wet state for further use.

Lastly. To complete these colors, put in a kettle ten buckets of water; add five pounds of madder, and work the silk well in this liquor, until it begins to boil; then take it out, rinse and dry it.

A Real Brown.—Take 6 ounces of annatto, 1 lb. of potash, 4 lbs. of alum, 5 oz. of fine galls, ¼ oz. of cream of tartar, 2 oz. of turmeric, and 10 oz. cochineal.

Boil a kettle with ten buckets of water, powder six ounces of annatto, and put it together with a pound of potash into the kettle, boil for a quarter of an hour, pour the liquor through a sieve into a tub, immerse the silk, and work it well in the liquor for the space of two hours; then take it out, rinse, wring and dry it. After this, pour eight buckets of fresh water into a kettle, and three pounds of alum, and dissolve it therein; then put the solution in a vat, steep the dried yellow silk, and work it well therein for the space of three hours, then take it out, wring it, and lay it by wet, for further use.

This being done, prepare a kettle with eight buckets of water, and bring it to boil; put into it ten ounces of cochineal, and let it boil for ten minutes; then cool the liquor with a bucket of water, and put into it a quarter of a pound of cream of tartar, and two ounces of turmeric, and stir the whole well; then steep the silk, previously alumed in the liquor, work it well therein for the space of two hours, during which it must be kept at a continual boil. This being done, take it out, rinse in running water, wring, and lay it by, in its wet state, for further use.

This being done, dye it in a keep, [dye tub,] light or dark as your taste may be, or according to the pattern which is laid before you.

If you do not wish to make use of the keep, or, as is often the case in small dying establishments, should you not possess one, you may apply the indigo coloring.

You may likewise color it in the liquor of logwood, which will render it equally handsome, but not of so lasting a color.

A real Crimson, in another way.—Take 2½ lbs. of Roman alum, 2 lbs. of fine galls, 1 lb. 4 oz. of cochineal, ¼ lb. of argol, and 8 oz. of spirits ammonia.

Take a kettle with eight buckets of water, put into it two pounds of fine galls, and let it boil for a quarter of an hour; run the liquor through a sieve into a pail; steep the silk in the liquor, and work it well therein for the space of four hours, then take it out, rinse, wring and dry it.

After this, take a kettle with eight buckets of water, and dissolve in it two pounds of Roman alum; pour it into a vat, steep the silk in the solution of alum, and work it well for the space of four hours in the same; then take it out, wring it, and lay it by, in a wet state for further use.

After this, to complete the color, take six buckets of water, pour it into a kettle, add one pound and four ounces of fine cochineal, a quarter of a pound of argol, and eight ounces of spirits of ammonia; let all boil well together for about ten minutes, then cool the liquor with two buckets of water, work the silk well in it for two hours; during which time it must be kept boiling continually; then take it out, suspend it on the rods over a vat, pour the liquor from the kettle into it,

and continue to work the silk in the liquor until it has become cool, then take it out, rinse it and dry it in the shade. By following the above directions, you will obtain a very handsome crimson.

To turn this expensive cochineal liquor to all possible advantage, (for it will still have retained some good coloring matter,) pour the above used alum liquor into it, and heat it again; which will enable you to color many lighter shades, from the rich peach blossom, down to the lightest lilac color. Having used it for this purpose, you may take more or less of silk of a yellow ground, and color it in it, which will receive a reddish yellow from it.

A handsome Red.—Take 8 oz. of annatto, 1½ lbs. of potash, 2½ lbs. of alum, 6 lbs. of Brazil wood, 5 buckets of sharp vinegar, and 6 oz. of composition composed of the following materials: 1 lb. of spirits of nitre, 2 oz. of sal ammonia, 6 oz. of grain tin—the tin and ammonia are to be put into a sand stone pot of sufficient capacity; upon these pour about 12 oz. of water, then add the spirits of nitre and let the solution take place.

Take for this purpose a kettle with eight buckets of water, and let it boil.

While this is doing, powder eight ounces of annatto as fine as possible; then put it together with one pound and a half of potash, into the above heated water; let the whole boil well for a quarter of an hour, and pour the liquor through a sieve into a pail. Steep the silk in this potash and annatto liquor, and work it well for two hours in the same; after which take it out, rinse it, wring it, and dry it.

Then dissolve one pound and a half of alum in a kettle with eight buckets of water; pour this solution into a pail, fix your silk upon rods, and work it well therein for two hours; then take it out, wring, and dry it.

When the silk is completely dry, steep the silk in warm water, until it has become properly soaked; then take it out, wring it, and lay it by for further use.

This being done, pour into a vat five buckets of sharp vinegar, and six pounds of Brazil wood, and let it stand for the space of forty-eight hours; then take the liquor out of the vat and pour it into a kettle; let it boil for the space of ten minutes; then take it out, pour it through a sieve into a vat, and throw the parts remaining in the sieve, in the kettle again; pour three buckets of water upon it, let it boil well for a quarter of an hour, and pour the liquor thereof to the other Brazil wood liquor in the vat.

This being done, pour six ounces of the composition into this liquor of Brazil wood, and stir it well; steep the silk previously soaked in warm water, in the liquor, and work it well therein for the space of two hours. Examine at the expiration of this time, whether the liquor still contains any coloring matter; if so, take it out, pour it into the kettle again, work the silk another time therein, during which it must be kept moderately warm; then take it out, rinse it in running water, wring it, and hang it up to dry. By observing the whole of the above process, you will obtain a very handsome red. By using eight buckets of vinegar instead of five, the color will be considerably improved, and by dispensing with the composition altogether, the color will become darker.

Lastly. If you desire to have this color of a darker fiery hue, add two pounds of Brazil wood, and one pound composition to the above quantity, and proceed in the same way as above directed.

To color Silk with Quercitron, in another manner.—A Citron Yellow.—Take 2½ lbs. of alum, 4 lbs. of sugar of lead, 2 oz. of chalk, and 3 lbs. of Quercitron.

Take a kettle with eight buckets of water, put into it two and a half pounds of alum, and dissolve them therein, then take out the alum liquor, and pour it into a pail, and let it become cold, add to it a quarter of a pound of sugar of lead, and stir it well until united with the solution of alum, then put into it two ounces of chalk, stir it well, and continue the stirring at proper intervals, for the space of

twelve hours, and set it by to settle. Pour off the liquor into a pail, but be careful not to disturb the sediment at the bottom; steep the silk in the liquor, and work it well therein for the space of six hours; then take it out, wring, and lay it by wet, for further use.

After this, take a kettle with eight buckets of water, put into it three pounds of Quercitron bark, and let it boil for the space of three quarters of an hour; pour it through a sieve into a vat, steep the silk which has been saturated in the foregoing liquor, composed of alum, sugar of lead, and chalk, in the Quercitron liquor, and work it well for the space of an hour; then take it out, rinse it, wring and dry it.

If you desire a higher colored citron yellow than the above, add another pound of Quercitron to the above quantity, and proceed in the following manner:

Saturate the silk, as above directed, in a liquor of alum, sugar of lead, and chalk, then take a kettle with eight buckets of water, boil two pounds of Quercitron therein, for the space of three quarters of an hour, and pour the liquor through a sieve into a vat, steep the silk and work it well therein for the space of two hours; after which, take it out, wring and dry it. This will have given the silk the best grounds for a good yellow color. After this, take another kettle with eight buckets of water, put into it two more pounds of Quercitron bark, and boil it for the space of three quarters of an hour; then pour it through a sieve into a vat, and work the previously colored and dried silk in the same, for the space of two hours; then take it out, rinse it, wring and dry it.

A high colored and deep Citron Yellow.—Take 1½ lbs. alum, 3 oz. of sugar of lead, 1 oz. of chalk, and 8 lbs. of French berries. Dissolve in a kettle which contains eight buckets of water, one and a half pounds of alum, pour the solution into a pail, or which is better, into a cask, and let it cool. This being done, put into it three ounces sugar of lead, stir it well with a rake, add one and a half ounces of freely powdered chalk, and stir the whole well again, and continue the stirring, every hour for twelve hours. But, after the last stirring, the rake must be taken out of it, to prevent the sediment from being disturbed, and then let it stand twelve hours. At the expiration of this time, draw off the liquor; but be careful not to disturb the sediment, which would otherwise create stains that are difficult to remove; pour the liquor, thus drawn off, into a vat, work the silk well in it for the space of four hours, after which, take it out, wring and dry it. This being done, moisten it with warm water, rinse it in running water, wring it and lay it by wet, for further use; then take a kettle with eight buckets of water, and at the same time, bruise eight pounds of French berries in a mortar; put them into a kettle, and let them boil for half an hour: then take out the liquor, and run it through a sieve into a vat. This being done, steep the silk in the liquor, and work it well therein for half an hour; take it out, wring and dry it; which produces a handsome citron yellow.

With the above used alum solution and French berry-liquor, you may without any other addition, color a brighter citron yellow. The same solution may likewise be applied with tumeric or weld, in dying.

A Nankeen.—Take 2 lbs. of fine galls, 1½ oz. of annatto, 4 oz. of potash, and ½ lb. of soap. Put one pound of finely powdered galls in a kettle of eight buckets of water, and boil it about ten minutes, then take out the liquor, and run it through a sieve into a pail. While thus employed, let half a pound of soap be dissolved in a bucket of warm water, and pour the solution into the liquor of the galls. Then put into a crock with water, one ounce of annatto, and four ounces of potash; boil it for half an hour, add the one-half of it to the liquor of the galls in the pail, and stir the whole well. This being done, steep the silk in the liquor, and work it well therein for a quarter of an hour. Examine the silk, and should it not have the necessary redness, add as much of the annatto liquor to it

as you may deem neeessary to give the color the desired tint. Then put the silk in again, and work it well therein for a quarter of an hour; take it out, rinse and dry it.

The Nankeen colored silk must not remain long without being rinsed, as this would create stains in it.

A handsome Turkish blue.—Take 1¼ lb. alum, 2½ oz. cochineal, ¾ oz. indigo, 3 oz. oil of vitriol, and ½ lb. composition.—The silk, after being boiled in soap and water, must be rinsed in running water, and then wrung and well beaten; this being done, it must be colored to a handsome light blue, in a cold or warm keep; then rinse it in running water, wring and dry it. As soon as the silk has become properly dry, it must be moistened in warm water, wrung and laid by wet, for further use. After this is done, prepare a kettle with 8 buckets of water, dissolve in it 1¼ lbs. of alum, pour the solution into a vat, steep the silk in it, and work it well therein for the space of an hour; then take it out, wring it, and lay it aside, in its wet state, for further use.

Lastly: take a kettle with 8 buckets of water, boil it and put into it 2½ oz. cochineal: let it boil for about ten minutes; cool the liquor, with a bucket of water, and add ½ lb. of the solution of tin, and ¾ oz. of indigo, which has been previously dissolved in 3 oz. oil of vitriol, and stir the whole well. This being done, immerse the silk colored blue in the cochineal liquor, work it well therein, until the liquor begins to boil; let it boil another hour, during which time the silk must, however, be continually worked; it must then be taken out, rinsed, wrung, and dried.

If you desire this Turkish blue to incline more to a red, take more of the cochineal—if the contrary, take less.

A handsome Green.—Take 2 lbs. of alum, and 4 lbs. quercitron bark—Take for this purpose, a kettle with 8 buckets of water, and dissolve in it 2 lbs. of alum—then pour it into a tub, and set it by until it is wanted.

While you are engaged in preparing the above solution, the silk must be colored in a cold keep to a handsome light blue, and after being rinsed in a stream, wring and steep it in the above mentioned alum liquor; work it well therein for two hours, then take it out, wring it, and lay it by wet for further use.

Lastly, put four pounds of Quercitron bark into a kettle which contains eight buckets of water, boil it well for the space of three-quarters of an hour, and pour liquor through a sieve into a tub.

At the same time, and while this is doing, prepare an incorporation of indigo and oil of vitriol, and pour the same into the Quercitron liquor in the tub, and stir the whole well. Into this compound liquor steep the silk, and work it well therein for the space of half an hour; then take it out, wring and dry it. In case the silk has not attained as handsome a green as desired, add a small quantity tumeric to the yellow liquor, which will assuredly have the desired effect. At the same time I would recommend not to color the silk too dark in the cold keep, as it is very difficult to produce a handsome green on a ground which has been spoiled by keeping it in the dark. It is therefore more advisable to have it of too light a color, as you may in that case, easily regulate the color by adding more of the preparation of indigo to the yellow liquor, as circumstances may require.

Best blue (ultra marine.)—The quantity of the necessary ingredients for this color must be regulated according to the quantity of the silk to be colored.

Make filings of copper free from all alloy of other metals: it is best, therefore, to rasp or file them yourself in order to obtain them pure. Put these into a glass vessel, pour spirits of salt, (muriatic acid) sufficient to cover them twice as deep as the space they occupy; let them stand for the space of twenty-four hours, or as long as necessary for the spirits of salt to attain a blue or a deep green color.

Then pour off the clean part of the colored spirits of salt into another glass vessel, and add fresh spirits of salt to the copper filings, and contine this process, until the whole of the copper filings have been dissolved, when nothing but the earthly and impure parts will remain.

Mix all these several blue or green colored solutions of copper, and add thereto as much spirits of ammonia as will be necessary to saturate themixture. Then moisten the silk in warm water, be careful to do this in such a manner that all parts will be completely and equally soaked in the water, then wring it and steep it in the blue tincture prepared as above directed, work it therein until it has attained a handsome ultra marine color; then take it out, wring it well, rinse it well in a stream, and dry it in the shade.

By minutely observing the above process, you will obtain a very handsome blue color, but which is not altogether lasting, as it will fade by being exposed to the sun, and turn to a greenish tint.

With the liquor which remains, you may color many other agreeable blue colors; but you must add at every coloring a small quantity of spirits ammonia to the liquor, as it would otherwise cause the color of the silk dyed therein to receive more of a green and less of a blue color at every succeeding coloring.

A Dark Blue.—Take 1½ ounces of indigo, ¾ lb. of oil of vitriol, 1½ lbs. of alum, 4 lbs. of logwood. The greatest attention and accuracy in the process of dying this color is necessary.

Before you proceed to the dying itself, prepare a solution of indigo in oil of vitriol, in the manner following: Powder very finely, and sift one and a half ounces of indigo, and put three quarters of a pound of oil of vitriol in a stone jar; add the pulverised indigo to it, stir the whole well with an earthen pipe stem, or some similar earthen article, and continue the stirring until the oil of vitriol ceases to ferment; the mixture having become quiet, set it by for the space of twenty-four hours; at the expiration of this time, a little water must be added, and the whole matter stirred again, by which it will receive, as it were, new life and vigor; after which it must be set away undisturbed, until it is to be applied to the dying of the silk. After this, prepare a kettle with eight buckets of water, put into it one and a quarter pounds of alum, and dissolve it completely therein. This being done, pour the solution into a pail, steep the silk in the solution, and work it well therein for an hour; after which, take it out, wring it, and lay it by, in its wet state, for further use.

This being done, put eight buckets of water into a kettle, pour the solution of indigo into it, and mix it well by stirring; work the silk well in this blue liquor for the space of half an hour, then take it out, rinse it in running water, wring it and lay it by, in its wet state, for further use. By this process, the silk will receive a handsome light blue color. To deepen this blue, or to change it to a darker blue, proceed in the following manner: Take a kettle with sixteen buckets of water and bring it to a boiling state; then put into it four pounds of logwood, and boil it well for three quarters of an hour; then take out one-half of the liquor, and run it through a sieve into a tub; let the other half or eight buckets of the same, remain in the kettle for further use; put into the liquor in the tub, a quarter of a pound of alum, which has previously been dissolved in some vessel; stir the whole well, steep the light blue silk in it, and work it well in the liquor a quarter of an hour; then take it out, wring it and keep it in its wet state, for further use, and throw out the liquor as useless.

Lastly: pour into another vat the remaining eight buckets of the logwood liquor left in the kettle, after having first run it through a sieve; steep the silk in the liquor, and work it well therein for the space of half an hour, then take it out, rinse it in running water, wring and dry it. By the above process, you will obtain

a dark blue, in every respect equal to any of the blues which have been coloured by means of the keep.

The above blue is likewise applicable to the dying of any other goods; and not alone in this respect, is it of advantage, but it likewise saves you the trouble and expense of preparing a keep for dying a small quantity of silk to a dark blue; and if the risk of missing a keep, and the consequent loss thereof be taken into consideration, the above receipt is of considerable advantage to the dyer, as well as to the manufacturer; particularly as the smallest quantity may be coloured equal to the colouring of a keep, by repairing the ingredients in proportion to the quantity of silk, which is to be dyed.

A handsome Violet Blue.—After the manner of the foregoing. Take 1 oz. of indigo, ¾ lb. of oil of vitriol, ¼ lb. of alum, 4 lbs. of logwood, and 1 lb. of Guinea or red wood.

The indigo must be dissolved in oil of vitriol, as directed in the foregoing receipt, and kept ready for use.

Dissolve in a kettle, with eight buckets of water, a pound and one quarter of alum; then pour the solution into a tub, and work the silk well therein for the space of one hour; after which time, take it out, wring and keep it in a wet state, for further use.

This being done, fill a vat with eight buckets of water, put into it four pounds of logwood, and one pound of Guinea or red wood, and boil the whole well, for about three quarters of an hour; then run the decoction through a sieve into a vat, steep the blue coloured silk in it, and work it well in the same for the space of half an hour; after which, take it out, rinse it in running water, wring and dry it.

A Deep Red.—Take 5 oz. of annatto, 1 lb. of potash, and 5 lbs. of madder—Into a kettle with eight buckets of water, put 5 ounces of madder, which has previously been finely powdered; add thereto a pound of potash, boil it well for a quarter of an hour, take the liquor out of the kettle, and run it through a sieve into a tub. This being done, steep the silk in it, and work it well therein for an hour; then take it out, rinse it, and let it dry; then dissolve two and a half pounds of alum in a kettle, pour the solution into a vat, steep the silk in it, work it well therein for two hours, then take it out, wring and dry it.

Lastly: fill a kettle with eight buckets of water, and five pounds of madder, heat it, but do not let it boil; while this is doing, moisten the silk well in warm water, so as that all of it may be equally saturated with water, which being done, take it out, and wring it; then steep it in the above prepared lukewarm liquor of madder, work it well therein, until it begins to boil; let it boil a quarter of an hour longer, during which time, the silk must be worked continually; then take it out, wring and dry it. The above process will produce a very handsome red.

A Green.—Take 1¼ lbs. of alum, 1 lb. of potash, and 8 lbs. of turmeric—The silk must be first dyed in a cold keep, to a handsome light blue; but caution must be used to lay the color equally throughout the whole of the silk, and that no stains remain in any part of it; rinse it in running water, wring, and lay it by wet, for further use.

Immerse the silk in warm water, in such a manner, that it will be equally and uniformly saturated with the water; then wring it, and lay it aside in its wet state, for further use. After this, prepare a kettle with eight buckets of water, put into it one pound of potash, and one and a quarter pounds of turmeric, and let the whole boil well for about ten minutes; then pour the liquor through a sieve into a vat, steep the whole in the liquor of the potash and turmeric, and work it well therein for half an hour. At the expiration of this time, it must be taken out, wrung, and put by for further use, in its wet state.

Lastly: put into a kettle with eight buckets of fresh water, one and a quarter pounds of alum, and dissolve it therein; then pour the solution into a tub, and work the silk well therein for the space of a quarter of an hour, which will change it to a handsome green, then take it out, rinse, and wring it, dry it in the shade.

PRESERVATION OF TREES AND CUTTINGS, &c.

When we speak of the *preservation* of the *Morus Multicaulis* trees, we would not wish to convey the idea that they require *protection* of any kind, if left in the ground where they may have grown, because from an experience of years, we do know that wherever they have had time to *ripen* their wood, the trees of the *first year's growth* will withstand the frosts of winter, however severe these may prove, provided the trees enjoy an *elevated location.* On *low fertile bottom lands*, owing to the luxuriance of the growth of wood, dampness of situation, and greater intensity of cold, we admit, that in such winters as 1835, they may be cut down to the earth; but even then, the *roots* will *remain unscathed*, and start up with the earliest vegetation of spring. As the trees have, however, become a merchantable article, and are taken up each season, for convenience in selling at times when they could not be dug up from the earth, it is proper that directions be given with respect to the modes of burying them.

Modes of burying the Trees.—1. Dig a trench of sufficient breadth and length to hold the requisite number of trees, about four inches deep, on an elevated piece of ground, where they may be kept *dry;* as the earth is thrown out of the trench, let it be carefully placed on one side of it, so as to form an inclined plane. Place the roots of the trees in the trench, regularly, and tolerably compact, resting the branches on the inclined plane, as above, to be formed. When your trees are all thus placed, fill up the trench with good clean sand, or light *mould unmixed with vegetable matter*, (the former is best) and cover both roots and branches 4 or 5 inches deep, with either of these materials; then throw on 5 or 6 inches of good sound earth, taking care to cover the whole mass evenly, and to shape the mound so as that the water will pass off freely, and find no lodging place; let the surface be firmly patted down with the back of the spade; this done, throw up a sufficient quantity of earth on the back side of your mound to afford protection, and give it the proper shape to carry off the water. Then dig a trench a short distance from your mound to receive and carry off the water as it descends from the mound, and your trees will keep safely until planting time in the spring.

2. Dig a trench 4 inches deep, of sufficient breadth and length to hold your trees, place the roots of your trees in it, on both sides, so as to make the tops and branches lap, inclining them to the centre; when your trees are all thus placed, fill in your trench with sand, or mould, as directed in mode No. 1; that done, throw on a sufficient quantity to cover the trees to the top, and then put on 5 or 6 inches of sound earth, and finish off as directed also in No. 1. This will give you an inclined plane on two sides, by which to pass off the water, the which must, as before recommended, have a trench provided to receive and carry it away.

3. Lay your trees on the ground, roots to roots in layers. After making the foundation of your mound say 4 trees deep, throw on sand, taking care to make it pass through the limbs; cover both roots and limbs, say 1 inch deep; then put on another layer of trees, as before directed, taking care to increase the height in the centre, and not to extend the trees out to the edge on either side: then cover with sand; continue your mound thus until completed, taking care to narrow it as you go upwards, so as, when finished, it will enable you to present a *point* at the top, that will not permit the water to lodge and penetrate; then finish off with sound earth to the depth of 5 or 6 inches, and your work is done, with

the exception that you must provide a drain to carry off the water, as before directed.

Trees may be thus buried in the *open air*, *under sheds*, or in *dry cellars*, with perfect safety—our experience, however, teaches us, that they keep better, much better, in the two former places, as most cellars are *too warm*, and promote the germination of the buds too early in the spring, and often jeopard their vegetation when removed to the hot-beds or open ground for culture.

The great objects to be aimed at in covering trees, are, *first*, to *keep them dry*; and *secondly*, to *prevent fermentation*—and both may very readily be effected, by shaping your mound so as to carry off the water freely, and by using *good clean sand* for the first covering, as we have directed. It may be said that covering 10 or 11 inches as we have directed, will not protect them from the frost; and we admit that the frost does penetrate much deeper, but we maintain that so long as the wood is kept *dry*, and you *exclude foreign substances, which in themselves are liable to fermentation*, no danger whatever is to be apprehended from the frost, as no injury can occur either to the *roots*, or *ripened wood*; or to the *buds*, when thus secured; the covering we recommend, being amply sufficient to preserve them through the severest winter.

Mode of burying the Cuttings or Branches.—Select a high and dry situation to bury your cuttings or branches on: get a sufficient quantity of good clean sand, make a bed of proper size, about 4 inches deep, of sand, then place your wood thereon; then sprinkle sand upon your branches until you cover them, taking care to let the sand penetrate among and through the wood; then put on another layer of wood and sand, taking care to narrow as you go upwards, so as to bring the mound to a point at the top, and to have an inclined plane on both sides; then spread over both sides about 4 inches of sand, so as to cover the branches that deep, and top off over the whole body, with about 6 inches of good sound earth; and to prevent the water from lodging, provide a drain to carry it off.

Cuttings, like *trees*, may be buried in the *open air*, *under a shed*, or in a *cellar;* but like the latter, they do better in the two former places, and for the reason assigned with regard to trees.

We have seen a covering of *straw* recommended: this we hold to be a most pernicious practice, as every substance capable of producing fermentation should be sedulously excluded.

TREATMENT OF ROOTS WHERE THE WOOD IS CUT OFF.

If you desire to let your roots remain in the ground, and to cut off the wood to propagate from, you can do so, taking care to leave a bud or two above the ground. As soon as the spring opens, and the frost is out of the ground, pass a *small* plough through your roots, so as to prevent the growth of *grass*, and open the soil to the warming influence of the spring's sun, taking care not to plough so deep, or near to the roots, as to cut them. Immediately around the roots, it would be better to use a good sharp *hoe*, so as to extirpate any grass, and stir up the ground well. After this, treat the field, or patch of roots, as you would your cuttings; keep the ground *clean* and well *stirred* throughout the season, up to the beginning of August, when they must receive a good dressing, and be laid by for the *wood to ripen.*

We prefer the *cultivator* and *hoe*, as the implements of culture; but if you have no cultivator, use a small plough, taking care to plough *shallow;* the hoe should always be used immediately around the roots. If the *cultivator* be used timely, it will be found a most efficient implement; but if your mulberries be neglected until the grass grows high, and its roots become deep set and difficult to get up, then the small plough must be used; but as the mulberry crop is one of immense value, we do hope that none will be found so reckless of their interest, as to let the weeds and grass grow so large as to require the plough to extirpate them.

FALL PLANTING.

In this method we have had no experience; but as we have seen it recommended, or favorably spoken of, by those in whose judgment and sincerity we have the utmost confidence, we do not doubt it would answer to put out both roots and cuttings late in the fall, if care were taken to give them a few inches of *extra covering* with earth; but then this would give additional trouble in the spring, as it would be necessary to remove the superincumbent earth, so as to only leave a covering of soil of one or two inches; so that but very little time or labor would be thereby gained. *Roots*, however, of one, two or more years of age, might be transplanted late in the fall, and left with a covering of two or three inches, in perfect safety, and would then require no removal of earth in the spring. The object gained by fall planting, is the earlier starting of the buds in the spring, but even here, very few days would be gained, and we do not think it desirable either for layers, or cuttings, that they should be planted before spring.

TIME OF TAKING UP TREES.

With respect to the *time* of taking up trees in the *fall*, it is impossible to fix upon a *precise day*—but if we consult *nature*, we can never err; for she points with unerring certainty to the period, when *her work* for the season is suspended. *When*, therefore, the leaves *fall* from the effects of frost, is the period at which the trees should be taken up; *then* it is, that nature says, as eloquently as she can,—"my labor has been performed, the sap has receded and ceased to nourish the branches, and now is the *time* when the culturist may in safety remove his trees from the earth." It strikes us to be consonant with common sense and the reason of things, that, until the elaboration of sap has been *suspended* by the effects of the season, it is as unwise as unsafe, to take up the trees, because until that has been done, the *wood* cannot be said to have been perfected, and that, wherever such arrestation of the works of nature takes place, there will be much *unripened wood*, which must shrivel, and perish, and be lost to the owner, whether he be the grower or purchaser.

Indeed we believe, that much good would result, if the trees were left in the ground for a week after the leaves have fallen, as a great portion of the wood would harden after that time.

We have deemed this paragraph especially neccssary, because during the past season, we saw a great number of trees that had been taken up prematurely, and forced into the market fully three weeks before the proper time. Those trees too, had been *stript* of their leaves by the *hand*; by which operation many of the buds were injured, which serious loss to purchasers, must be added to *that* arising from the shrinkage and shrivelling of a large portion of the wood. If we are asked what could have induced the growers of the trees, to which we allude, thus to place them in the market before their time?—without subjecting ourself to a want of charity, we think we may reply, that they could have been influenced by no nobler motive than that which arose from a desire of *forestalling* the markets into which they were thrown, without feeling the least regard for the interests of those who might become purchasers—and such motive, and rule of action, we hold to be as *disreputable* to the former, as we are sure it will prove *injurious* to the latter. It is a fraud upon the innocent which cannot be held up in terms of sufficient strength to convey an idea of its *moral enormity*. In future, we sincerely hope, that this practice, so much more "honoured in the breach than in the observance," will be discontinued altogether, as it is a vile cheat upon the community, and calculated to do great injury to the silk business. In conclusion we would remark, that the *season* should be permitted to do the work of *stripping* off the leaves in the fall, as the *human hand* was never made for the performance of any such office, and would advise all to consult *nature*, and she will tell when trees may be safely removed.

CONCLUDING REMARKS.

Having finished the instructive part of our unpretending work, we would be permitted to make a few general remarks upon the propriety of agriculturists adopting the silk culture as a branch of their respective systems of husbandry, and will also avail ourself of the occasion to present such other views as appear to us to be kindred to the subject.

We ask of our countrymen to receive the result of our labors with *indulgence*, as in preparing our *Manual* for the press, we have had no ambitious views or aspirations to gratify—pride of authorship never once entered into our mind—and in perfect truth we may most solemnly affirm, that our chief object in incurring the labor and expense of publication, is to do good. The *hope* that we might be the humble instrument of commending the silk culture to the notice of that class of the community with whom our present and future interests and feelings are identified, has borne us up through many disadvantageous circumstances, and enable us to present what we have written to the consideration of the *public*; and to its *decision*, we shall most cheerfully submit.—Be that *decision* what it may, we shall have the consolation to reflect, that we have disinterestednesss as the offspring of our *motives*, and that no man can rightfully charge us with a want of *fidelity* in the execution of our work. Of our motives we may, without rendering ourself liable to the charge of egotism, observe, that for years it has been manifest to us, that our country was in want of some other branch of agricultural industry, the products from which would serve to equalize the rates of *exchange* between us and Europe, and thus operate to reduce that balance of trade, which has so long pressed with such an onerous weight upon the enterprise, industry and resources of our people, and rendered us so often, and so disastrously, the sport and victims of the revulsions of trade in the old world. Again, it appeared to us peculiarly proper that some other *new* branch of industry should be added to American husbandry, in order that *profitable employment* might be given to the females, the younger members, and the aged and infirm, of the families of the middling and poorer classes of our farmers and planters, and to the aged and young negroes of those in more opulent circumstances. And in casting our eyes in quest of it, we were very forcibly struck with the countless advantages—the happy adaptation of the *Silk culture* to the objects we had in view. In the present state of the agriculture of our country, we are aware that, in numerous instances, virtuous females, the wives and daughters of families in humble life, are compelled by dire necessity to labor in the field, and participate with their husbands, fathers and brothers, in their more laborious toils. This, if possible, should be avoided; and we look forward to the day, and not a distant one, when every farmer's wife and daughter may, through the instrumentality of the silk culture, be relieved from those menial offices. The occupation of females in such unbecoming employment, is not confined to any peculiar section of our country; but is more or less peculiar to all. Some short time before we published the *first edition* of our *Manual*, we received from a gentleman of South Carolina—a man whose *heart* is in the right place, and whose feelings are as philanthropic as his mind is enlightened—we say we received from him a letter, in which he remarked—

"There are hundreds of our citizens, *females*, who can hardly make out to keep the *bone greased* by their present employment. Many of our females among the poor class, are under the necessity of working in cotton fields. This has always crossed the grain with me, and I have most ardently hoped that they might find some less laborious employment, that would yield them as much more profit; *and I now look forward to better times in this part of the country. The common mulberry grows wild in great abundance in this section of the state, and cocoons of a fine quality have been produced from worms fed on them.*"

This is, indeed, a most deplorable picture of the condition to which some of the females of South Carolina, in humble life, are reduced; but it is not the less true, and though companionship in misfortune should rationally afford no consolation, this wretched condition of things is not confined to that intellectual commonwealth alone; but as we have before observed, it is too common a thing in our land, and may be witnessed in every state in the Union—it may be said to have a "local habitation" in all parts of our country. And although *human misery* and *abject want* are to be met with more seldom in America, perhaps, than in any other country in the world, still they abide among us, and bear with the more severity upon the gentler sex, their offspring, and the aged, than they do upon any others. In this condition of things, a *remedy* is absolutely and imperiously called for, and it becomes the business of the statesman, the political economist, and the philanthropist, each and all, to endeavor to discover one, and when discovered, to give to it the proper direction—to lend to it all his energies—to support it with all his talents and zeal. To our mind, the *Silk culture* offers a sure and certain *remedy:* it unfolds the means of employment best calculated to do the greatest good—to save our countrywomen from those labors to which they are now subjected, which are so ill suited to their sex, and so revolting to the eye of philanthropy—it is, above all others, that business best adapted to the wants of the nation. It is as replete with *interest* to the intelligent and refined rich, as it is full of promise and hope to those in the humbler walks of life. To all it comes with healing on its wings. What can be more intensely interesting to the philosophic mind, than to see those ingenious insects busily engaged, during their short career, in fabricating the most beautiful article that enters into the clothing which decorates the human form? How insignificant does man feel in the scale of the arts, as he beholds the humble silk-worm excelling him in ingenuity?—But however interesting this part of the picture may be, there are others of infinitely more importance in their individual and national bearing. We allude, *first*, to the employment which this branch of industry will afford to the deserving and meritorious poor—to the degree of solid comfort which it will vouchsafe to the home of the cottager—to the innocent delight—the boundless joy—that it will carry to the bosoms of the thousands and tens of thousands of virtuous females, and those upon whom age and decrepitude bear with so oppressive a weight. *Secondly*, to the large slave owner it offers employment of a profitable character to his young and aged negroes, thus enabling him to convert the services of those who have been hitherto burthens upon him, into sources of a lucrative kind, as the child of seven years and upwards, as well as the old hands who have been long consigned to the chimney corners, the corn-crib, and the meat-tub, are efficient helps in the feeding of worms. And *lastly*, we ask the statesman to contemplate the sum of benefit which will result to us in our national capacity, whenever our country becomes in part a silk-growing one. With proper care, if fostered by the people, we have no doubt that in twenty years as many millions of dollars in value may be added by the products of the silk culture to our *exports*. We will not enlarge upon this branch of the subject any farther than to give an extract from a letter which we addressed last winter to a friend in reply to certain *queries* which he propounded to us, while the subject of encouragement was pending before the Maryland legislature. The reply we then gave, seems to be so opportune to the subject matter now in hand, as to require insertion here, and we trust it will present the question in a light so favourable, and so unvarnished, as not only to attract attention, but to challenge credence. We give the extract below, and shall levae to the reader the task of discovering what would be the amount of *national benefits*, from those we have shown to be derivable, easily, by a single state:

"6. *What amount in money-value, will any given number of acres in the Mulberry and Silk culture, give to the labor of the State?*"

This question, "though last is not the least in my affections," for it opens a wide prospective field of promise for the people of my native State, if they should but have the wisdom and forecast to improve the opportunity now presented for their acceptance. As your query gives me the privilege of assuming any given number of acres as my *datum*, I shall fix upon the same number named in my memorial to the General Assembly, and show by my detail, that the aggregate sum therein stated, is much, very much below what may be realized. I state as my belief, in that paper, that in ten years, if the people so will it, the agricultural products of the State may be increased in amount by the Silk culture, *five millions* of dollars; the data I therein furnish proves that that sum is not a moiety of the amount that may be produced on 5,000 acres. My object in thus keeping down the amount of product, is to be found in my desire to make no over-sanguine calculations that contingencies might prevent the fruition of.

With these explanatory remarks, which I make for your satisfaction and in justification to myself, I will now proceed to answer your sixth and last query, and availing myself of its scope, I will presume that the culture in Maryland has so far progressed, as that her citizens have 5000 acres under cultivation. If the species of mulberry grown be the Morus Multicaulis, I maintain that each acre, after the first year, will be capable of affording a sufficient quantity of foliage to feed a *million* of worms, and this, you will readily conceive to be possible, when I tell you that these trees, or rather *shrubs*, for ordinarily, they do not grow higher than from 6 to 8 feet, will bear 3630 of them being planted on one acre, the eligible distance being 2 by 6 feet. Though low of stature, they make up for that deficiency in the number of their stalks,—hence their cognomen, *Morus Multicaulis*—the *many stalked* mulberry—and those *stalks* are filled with lateral branches from their starting place at the earth, to near their extreme points. Their leaves, too, are of great size, many of them being from 10 to 13 inches either way, and being so clear of stems, or indurated fibres, as to be nearly all edible by the worms.

Having supposed that 5000 acres are in the mulberry culture, I will give you the *data* of my calculations, in order that you may make your own, and thereby satisfy yourself as to the justness of mine. As one acre will feed 1,000,000 of worms, and 3000 cocoons will make 1 lb. of silk, so will 1,000,000 of cocoons make 333⅓ lbs. of silk; and as 1 acre yields 333⅓ lbs. of silk, so will 5000 acres yield 1,666,666⅔ lbs. of silk. It will require 10 children between 7 and 10 years of age* to gather the leaves and feed the worms which can be supported on an acre. Besides these, a careful person, male or female, should overlook them, and see that the work is faithfully done—this latter person, I shall leave out of my calculation, as the duty should either devolve on the head of the family, or some one of his household in whom he can confide, and therefore no actual *money* charge upon him. Then as it will take 10 children to an acre, so it will take 50,000 to attend 5000 acres. If these children receive 75 cents per week for their labor, and they ought to get that or more, as the culture will bear it, they will each earn during the 6 weeks of the feeding season, the sum of $4½; or the wages of the 50,000 during that time will amount in the aggregate to $225,000. If they were to get $1 per week, the aggregate of their wages would be $300,000.

This is but one branch of the laborers to be employed. After the worms have spun their silk, then comes in the female department to convert the cocoons into sewings, or raw silk. The 5,000 acres as I have shewn will produce 1,666,666⅔

* We have said children of these ages, because they are just as competent to the task as adults—but grown females and infirm males are equally eligible attendants.

lbs. of silk. If this quantity be spun into sewing silk, as one woman is only competent to spin ⅔ lb. per day, and there are about 213 working days in a year, she can only make 142 lbs. in that time, so that to convert the whole quantity into sewing silks, it will require the services of 11,737 women to do so: now if these be allowed $3 per month, their aggregate wages will amount to $422,732 for their year's services—if $4 per month, it will be $563,376. The money value of labor will then stand thus:

For 50,000 children as feeders at 75 cents per *week*,	$225,000
For 11,737 women as spinners at $3 per month,	423,732
	$648,732

Or thus:

For 50,000 feeders at $1 per week,	$300,000
For 11,737 spinners at $4 per month,	563,376
	$863,375

Should a portion of the product be made into *raw* silk, as it doubtless will be, fewer females will be required for that service, as the silk *reels proper*, unwind a much larger quantity of cocoons than the machine combining both the operation of spinning and reeling. I should say, that four times the amount of work may be done, so that a deduction of female laborers in that proportion ought rightfully to be made for whatever quantity of raw silk which should be made. But suppose I assume as the sum of money-value for labor to be given to the State by this culture, is only $500,000, and I would then ask you, if the laborers employed be indigent white females and children, what a volume of real comfort and happiness would that sum confer upon that worthy, though suffering portion of our state? How many countenances that are now dimmed with suffering, would it brighten? Look around you, sir, in your own immediate neighborhood, if there be not many a poor widow with her helpless offspring, to whom such employment would not be emphatically a God-send? Have you not often in your experience through life, seen a poor man, the head of a family, cut off, leaving behind him a widow and some four or five children utterly destitute?—In looking on such a scene of desolation, have you not often felt your heart's pulsation quicken almost to suffocation? If you have witnessed such a scene, so has every man in every neighborhood in our State—and to such—to thousands of suffering poor which are to be found in all the States of this Union, this branch of agricultural employment, would prove of the very first importance. Instead of the children of the poor being *burthens* as they now are, they would become so many *sources of revenue* to their parents, and while their labor would form an important item in the sum of individual wealth, so would it comprise one of equal moment in that of our State, for it is of such materials that national wealth is constituted.

It may be said that a large portion of this labor would be performed by the slave population of our state; but this does not in the least change the amount of appreciation given to the labor of Maryland; for their services would be just as valuable though their masters should be the recipients, as if the same amount was paid away to free white laborers, with this in favor of their masters, that it would be so much *saved*, and as the proverb says, a penny saved is a penny gained, it is, therefore, clear, that whether the labor be performed by the one description of laborers, or the other, the increased value of the labor of the State would be the same.

I have thus far confined myself to the *value* of *personal* labor, because I thought from the *phraseology* of your question, your intention was that I should so construe it; but as I have thus conformed to what I conceived to have been your

views, let me take another and broader view of this subject. The *money-value* to be given to the *labor* of the State, by the occupation of 5,000 acres in the cultivation of silk, is what the silk produce will bring; for it is the *labor*, after all. that imparts value to the commodity from beginning to end. Let us see what that is. Now, as I have before shewn, 5,000 acres will produce 1,666,666 2-3 lbs. of silk. This, if sold as *raw silk*, at $4 per pound, would be worth $6,666,666 66 2-3—if as sewing silks, $11,666,666 66 2-3. So you see, my dear sir, what an immense appreciation, even 5,000 acres of our worn out soil is capable of giving to the products of the State—or as you have it, perhaps, more properly, to its "*labor.*"

I think you will coincide with me in the opinion, that in *ten years* the number of acres of land named above, may be appropriated to this culture without in the least interfering with our present systems of agriculture. And here let me assure you of the sincerity of my belief, that whenever this result shall have been brought about, that Maryland will be one of the richest and happiest states in the Union. What is to prevent us from becoming so? Apathy on the part of ourselves, and neglect on the part of those whose province it is to nurture and protect the public interests. Let me ask you sir, if when many of our most enterprising and industrious citizens are departing from among us, to return no more, as *citizens*—when many estates are left unoccupied, and neighborhoods in some of our counties literally broken up, if it is not mete that some noble effort should be made to arrest the evil? Does it not behoove those who represent the descendants of that gallant band of granite hearts, who perilled for our liberties, to do something worthy of that fame they won so dearly? Does not self-esteem, patriotism, and state pride, all combine to demand that some substantive measures should be adopted to court and bring out the resources of Maryland. Our climate and soil are most happily adapted to this culture; and as it is well known that poor soil makes the best silk, why should we not embrace the occasion to render our worn-out fields available? To give profitable employment to our population—and especially to that portion of them whose helplessness commend them to our sympathy and protection? Self-interest, humanity, and public policy alike dictate the course.

Let me ask your permission to claim your attention a few moments longer, while I apply a few remarks to individuul cases. An *industrious poor man* has *half an acre* in the culture; he and his working hands attend to his other farming operations—his *wife* and his *small children* attend to the feeding of the worms, and the former after the cocoons are made, converts them into sewing silks, by which she realizes a *clear profit* of upwards of *seven hundred dollars*, a much larger amount than her husband and some four or five working hands realized off of a hundred acres in ordinary culture. *Another*, with larger means, has one acre in mulberry, his wife and children attend to it, and he gains by the operation a nett profit rising *fourteen hundred dollars*. A *third*, with still larger means, has two acres in the culture, and he netts a profit over $2,800—and these profits are exclusive of the value of their respective families' services. A fourth, with ample means has his 10 acres in the culture, and he receives a nett profit nearly amounting to $15,000 a year. Now I pray you to picture to yourself the relative degree of comfort and opulence which such a state of things is calculated to produce in a very few years. Examine the question in all its bearings; make the proper application of its benefits and its blessings, and I am sure you will stand up the bold and fearless advocate of the cause."

We ask the reader to reflect well upon the views we have offered to his consideration, and we pray him to believe us when we declare, that they are not the mere *speculations* of enthusiasm, but are the sober *deductions* of mathematical calculations: and we further ask him, to contemplate the sum of prosperity and

happiness, which the mulberry and silk culture is calculated to confer upon the American people. We ask him to picture to himself the changed appearance of things which would be wrought by such an outpouring of blessings. We request him to bear in mind that there are but few *small farmers* in our land, whether *proprietors* or *tenants*, that do much more, to use a familiar phrase, "*than make both ends meet*," under the present state of agriculture; but few, indeed, who are able to give their children any thing more than a common education. But let the Silk culture be once adopted, and again we ask him, if it is not competent to produce an entire revolution in the moral and pecuniary condition of our people.

Deeply impressed with a high and abiding sense of the great value to result from it, we call upon the rich and enlightened, by every consideration of patriotism and interest to rally to the rescue of their country, and set an example worthy of all emulation—we appeal to those in humble life, as they love their wives and children, to follow the example we would here invoke. We call upon every man pursuing agriculture as a business, to engraft the Silk culture upon it as a *branch*, as it is the interest of themselves and families that they should do so. And in closing our labors, we must be indulged a few remarks expressive of our hopes, that a feeling and an interest have already been aroused, which will not slumber until the triumph be complete. We are doubly solicitous on this head, because we see in the success of the Silk culture, the surest means that philanthropy could desire, for sustaining the thousands and tens of thousands of poor women and children, whose support is now stinted and precarious; because we see in it too, a radical cure for an evil which is sweeping the inhabitants from the old states and settlements with a force which almost threatens depopulation to many neighborhoods; and lastly, because it will afford the pecuniary ability of improving the other portions of each estate on which its culture may be introduced. To several of the old states, it offers the only available resource for political safety—the only guaranty against those encrochments which never fail to follow in that train of evils that befal the *weak* in the vicinity of the *strong*. There is no truth more firmly enforced by history, than that *peace* and *independence*, is only to be expected where the ability to repel and punish aggression is enjoyed. It should, therefore, be the policy of small powers living in close vicinage with large ones, to keep a careful prospective eye about them, in order that their more potent neighbours may not be provoked by their weakness to contemplate their subjugation; for the history of the ancient Republics confirms the melancholy truth, that *power*, in the view of nations, is but another word for *right;* that the ties of consanguinity and the claims of common origin, offer no barriers to that unchastened ambition and unbounded desire of conquest, which is indulged in by most states, towards their weak and defenceless neighbors.

ADDENDA.

By the politeness of A. H. Brown, Esq. of Frederick county, Maryland, we have been permitted to copy the following extract from a letter to him from the Hon. *Ambrose Spencer*, of New York. Coming from so high and so disinterested a source, the subjects of which it treats will be esteemed as the more valuable. For the favor of copying it into our Manual, we return to Mr. Brown our unfeigned thanks, and trust that the enterprise that he has just entered upon with so much public spirit, and so much patriotism, may prove of lasting benefit not only to him, but to his country. The letter is dated ALBANY, August 6, 1835:

"SIR—Your letter of the 28th ult. was received this morning, and I beg you to be assured, that I receive great pleasure in the extensive correspondence which my feeble efforts in what I believe to be of national importance, have opened to me. I need not assure you of my hearty concurrence in the opinion you express of the wealth which those who enter upon the culture and manufacture of silk must attain, provided they are guided by intelligence and a firm and resolute purpose. Beyond all doubt the localities which you describe as in your possession, must be equal if not superior to any in this country. Although I am of opinion that the culture of silk may be conducted successfully in all parts of this Union, yet I do think that the climate of Maryland must have superior advantages to a more frigid region. At present I know of no person whom I could recommend to you to unite with you on the terms proposed; undoubtedly there are many who would be glad to embrace such advantageous terms.

I approve of your plan to plant this fall 20 acres of the Morus Alba; it is undoubtedly preferable to the indigenous Mulberry, which bears most generally a purple fruit; and I should suppose that if the trees near the Cocoonery were kept low, would vastly facilitate the gathering the leaves. I believe in my letter to Mr. Hopkins, I spoke discouragingly of the propagation of the *Morus Multicaulis* or Chinese Mulberry, from the aptitude of these trees to be killed down by our intensely cold weather—the reason of this, is, that they grow so luxuriantly that the wood does not ripen sufficiently to resist the frost; probably in your latitude, they may withstand the winter; if so, they are worthy your attention, as the leaves are very large and tender, and afford the most desirable food to the worms. I advise you to try them on a small scale, from cuttings."

We are indebted for the following excellent paper to *Gideon B. Smith*, Esq. upon the virtues and mode of culture of the *Morus Multicaulis*:

EDITOR FARMER AND GARDENER—

Sir—Having seen many statements and suggestions in the public prints, that the Chinese Mulberry, *Morus Multicaulis*, was not as hardy as the White Mulberry; that it would not bear the extreme cold of our winters, &c. I deem it proper to state my own observations on the subject. I was the first person south of New York, who had the Morus Multicaulis. It was sent to me by my old friends, Wm. Prince & Sons in 1828, in a collection of seven other varieties of Mulberry. It was not then known by its present name, but was called the Phillipine Island Mulberry, and I believe was received by the Messrs. Prince, direct from those Islands. About a year after I received it, accounts were received from France of the receipt there of the Morus Multicaulis, and its graat value for feeding worms. On examining my trees, I at once found that my Phillipine Island Mulberry, was the Multicaulis, and immediately commenced feeding my silk worms with it; and from experiment ascertained the truth of all the French had said about it. From that time to this I have continued to urge upon all, the propriety of cultivating this, in preference to the White Mul-

berry. Its advantages are—it is *fully as hardy* as the White; one pound of its leaves contain as much nutritive matter, as a pound and a half of the white; the silk made from it is of a finer texture and more lustrous; its leaves are so large that a pound can be gathered at half the expense and trouble that a pound of White Mulberry leaves require; it can be cultivated with infinitely more despatch than any other kind. These are all great advantages, and I am so well convinced of the correctness of this statement, that I do not hesitate to say, that within ten years no other mulberry will be cultivated for feeding silk-worms; simply because those who feed silk-worms upon White Mulberry leaves will not be enabled to compete with those who feed on Morus Multicaulis, and they will be either compelled to abandon the silk business or adopt the Multicaulis for feeding. In relation to the hardiness of the Morus Multicaulis, I have to remark, that I have cultivated it for *seven years;* never protected it in any manner whatever, and never lost a tree by the cold of winter or any other way. I had fifty young trees in my garden last winter, and not even a bud on the extremity of the branches was injured. It is true about 50 yards west from where the young trees stood, there is a grove of oak trees, and on the north, 50 yards distant, my dwelling house stood; and the garden has an exposure to the south with a gentle declination. But my residence in the winter of 1831—2, was very different. It was on a farm four miles in the country in a north east direction; the situation at an elevation of 300 or 400 feet above tide water. There my Morus Multicaulis had an open exposure to the north west wind; yet none were injured. During the whole time I have had the White Mulberry of various varieties, and have observed that they were all equally hardy—none more so than the Multicaulis. I have seen the young *unripened wood* of all the varieties destroyed by the winter, and was very early led to adopt measures to guard against it, and now I never lose a *bud.*

None but the young trees are ever injured by winter, and all we have to do is to give *them* such a start, as to enable them to ripen their wood previous to the approach of very cold weather. I raise all my trees from cuttings in a hot-bed. About the 1st of March I make an ordinary hot-bed like those used for raising cabbage plants; then I take the young wood of last year's growth, and cut it into pieces about two inches long, merely leaving a single bud on each; these pieces I stick into the hot-bed three inches apart in a slanting direction, the upper end inclining to the north, and burying it so that the point of the bud is barely seen at the surface of the earth; sprinkle the bed with a watering pot and put on the glasses; keep the bed properly moistened by watering every day, and throw matting over the glass at night, and in the middle of the day, to protect both from frost and hot sun. By the middle of May the plants will be four to six or eight inches high, and may then be transplanted to the place they are to grow, like cabbage plants, watering them once a day for eight or ten days; if the weather is dry, they will be found to be well rooted and will grow four to six feet the same season, and will ripen their wood so that the ensuing winter will not injure them. After the first year I have never seen any of them lost by winter, except in some extra cases, and in these cases the White Mulberry has suffered, and even the native mulberry, fully as much as the multicaulis. Last winter, a white mulberry tree seven or eight years old, in the western part of the city of Baltimore, was killed to the ground; while my Morus Multicaulis not a quarter of a mile from it, and north of it too, and in a higher situation, was not injured.

In fine, sir, I am in no way interested now in the business of raising mulberry trees or silk, so that I can be influenced by no mercenary consideration in giving my opinion as above, and therefore, the more dependence may be placed on these suggestions. The manner of propagating above described, is my own

discovery, and has heen practised by me four years with invariable success. I would earnestly recommend it to all who are preparing for the silk business. I would also mention that in 1832, I had fruit on one of my trees, which furnished good seed, from which I raised several trees, which were exactly like the parent tree. The seedling trees grew so slow, however, and the seed bed was so troublesome to keep clean of weeds, that were my trees to produce ever so much seed, I should never use it; trees being so much easier raised as above from cuttings. The Morus Multicaulis is evidently as distinct a species, as is the alba, rubra, nigra, &c., and the seed therefore produces its like, the late publication in the Eastern papers notwithstanding. I suspect the seed obtained from China and distributed in New England, was more or less mixed with other kinds. The fruit of Morus Multicaulis is *black*, small, (less than the white,) of a pleasant, acid taste; the juice stains the hands first deep purple, and when exposed to the air very black, requiring the acid of chloride to take it off; hence I infer that it will make a handsome dye. Very respectfully yours,

GIDEON B. SMITH.

We annex the letter of Mr. McLean, on the subject of his *experiment*, to which we have before alluded, and ask for it an attentive perusal.

From the American Silk Grower.

Messrs. Editors—Having fed a small number of silk worms the past season, and having, as I suppose, succeeded well, I send you a brief account of my fixtures, feeding, &c. If you think my experience will in the least degree aid the good cause in which we are in common engaged, you are at liberty to publish it. My cocoonery is 36 feet by 18, two stories high, lathed and plastered, with a chimney in each end, and a cellar under the whole. The building is substantial and well finished. It has 38 windows and 5 doors, blinds and venitian shutters. The building was intended to be converted into a dwelling in the event of its not being used as a cocoonery. Two rows of shelves, the whole length of the building, were put up, each shelf one foot above the other, so that I had large aisles between the rows and shelves and around them, affording ample room for feeding the worms and changing the hurdles. My hurdles are 3 by 4 feet, made with cotton twine, not knit, but crossed as a bed cord. I supposed I had accommodations for feeding 2 or 300,000 worms hatched in succession. I accordingly procured two ounces mammoth white eggs, from Mr. Stone, of Burlington, which were understood to come from Germantown, Pa., and several ounces of sulphur colored, from Mr. Comstock, of Hartford. These were all put in glass jars, and placed in the ice house about the 1st of April. The 15th of June, the mammoth white were taken out and exposed for hatching, and in a few days, about 5250 of them hatched, which was all I obtained from the two ounces. I then exposed those I obtained from Hartford, not one of which hatched. Disappointed in my eggs, I called on Mr. A. M. Jerome, of Princeton, who supplied me with a paper of eggs which were in the process of hatching. These I brought home on the 26th of June, and about 25,000 of them hatched. I had then altogether about 30,000 worms. I placed them all on the shelves in the second story; about 12,000 on one side of the room, and the balance on the other side. I fed the whole on the multicaulus, grown from roots and cuttings planted this spring. During the whole time of feeding, the temperature ranged very high, being several days as high as 93 degrees Fahrenheit, and seldom less than 72 degrees.

When I commenced, all the knowledge I had on the whole subject was "book knowledge." I had never seen a cocoonery, and never but once had seen worms feeding. My colored man, who had never seen worms, gathered the leaves and fed the worms until about two weeks of winding, when I employed an aged man to assist him. Having some leisure, I spent considerable time in the cocoonery, determined to watch the feeding with care. A premium of $100 having been offered by the Monmouth Silk Manufacturing Company, to the person who would

raise the greatest number of pounds of cocoons from the sixteenth of an acre, I measured the above quantity of land, and planted it with roots set upright, the rows eighteen inches apart, and the trees eight inches apart in the rows. The 12,000 worms alluded to I fed on the premium trees. The drought continuing so severe, and fearing the leaves on the premium trees would fail, on the 19th of July I took off about 5000, for which I borrowed leaves to carry them through. From this time it required 143 pounds of leaves. In about twenty-six days the mammoth white began to rise, and in about thirty-one days all, or nearly all, had risen. On the 28th day a few of the sulphur began to wind, and by the 35th day, all had wound. As a general rule we fed four times a day, never at night. After the second week we changed the hurdles every two or three days; the room was well ventilated, and always sweet and clean. Although good attention was given to all the worms, yet a little more attention was given by myself to the premium worms. They were fed just as often as they consumed the leaves previously given, and the difference in the size of the cocoons was obvious, the premium cocoons being very perceptibly the largest and most firm. The whole number of pounds of cocoons from the worms fed as above, was 86 lbs. 9 oz.; the whole number of pounds fed on the premium trees was 38, or if an allowance is made for borrowed leaves, allowing 31 pounds of leaves to a pound of cocoons, the number fed on premium trees would be 31 lbs. 14 oz. Of the mammoth white it required 350 cocoons to make a pound; of the premium sulphur cocoons 290 to 300; 192 of the largest, after the floss was taken off, made a pound; of the sulpher colored cocoons, not premium, it required about 325 to make a pound. The worms were vigorous and healthy during the whole time of feeding, I think remarkably so; indeed I do not know that I lost a single worm by disease. Being a healthy crop, I saved most of my cocoons for eggs, and I have about four pounds of the finest eggs I have ever seen. I stifled, probably, 25 lbs. of cocoons in order to make a specimen of sewing silk. August 4th I obtained a small paper of two crop eggs from Wm. Imlay, Esq., of Allentown; only 300 or 400 of them hatched, which I fed on my premium trees. These were also healthy and vigorous, but they did not wind under thirty days, and the cocoons were small. Owing to the impossibility of procuring eggs to hatch in successive crops, I have only raised 31 lbs. 14 oz. from my one sixteenth of an acre, though my trees are smaller than yours in Burlington. This I believe, is not more than one-half the amount I could have fed if I had been able to procure eggs and hatch them as wanted. The trees do not appear to have lost any of their foliage. Enough has been done, however, to show that raising silk is profitable even the first year, in the hands of the most inexperienced. I hope you will write an article on this subject, and from what *has* been done, show what *can* be done. From my experience, I am perfectly satisfied there is no mystery or difficulty in feeding the silk worm. If the eggs are from a healthy crop, and if the worms are kept clean and well fed, success is certain, and from the acknowledged enterprise of our people, I am perfectly satisfied the silk business will succeed, and at no distant period will become a source of vast national and individual wealth. May your valuable publication aid, as I have no doubt it will, in hastening this, by inducing our intelligent farmers and others to engage in the business.

Yours truly, R. V. M'LEAN.

Freehold, N. J. Sept 20, 1838.

MARKET FOR SILK AND SILK GOODS.

We annex an exhibit from the Treasury Department of the United States, shewing the amount of Silks *imported* into, and *exported* from, the United States, from the year 1821 to the year 1837, both years inclusive; by which it will be seen, that, from a fraction less than four and a half millions worth of silk imported in

1821, the *amount* gradually increased up to 1836, when it amounted to only a fraction less than twenty-three millions of dollars. The *amount* of silk imported in 1837, is, to be sure, greatly reduced; but then that is to be ascribed to the embarrassed condition of our commerce, arising out of the derangement of the currency; and we think it may be set down, that the *home demand* for silk goods, of all kinds, is equal to twenty millions of dollars, annually, in amount; and that this demand will increase in the same ratio as our population. If this assumption be correct, we may safely infer, that in twenty years the home consumption will equal in amount forty millions of dollars. Should not these facts be sufficient to stir up our people to an effort worthy of their character for enterprise and industry? With a present home market of twenty millions, and a *prospective* one of twice that amount, why should we halt in our exertions to become a silk growing country? It may possibly be advanced as an argument against *prompt* action in the premises, that there are not *now* established in the country, a sufficient number of factories to consume that amount of raw silk. If that argument should be started, we meet it by observing, that there are at the present time, more manufactories organized in our country, than will be sufficient to work up all the silk that will be raised for several years, and that by the time the supply of home grown silk shall meet their ability to manufacture it, others will have been erected, so that there need not be any fears entertained of a ready market for all that may be raised. Let the farmers and planters furnish the *raw* material, and we pledge ourselves that there will be manufacturers at hand to receive it, and give them handsome prices for their commodity. It is a fact well known, that for want of the home-made article, those engaged in making silk goods, have to get nine-tenths of their supplies from abroad. This state of things should not exist, as our people have it in their power to furnish it themselves of better quality than that now imported.

Besides this immense market at home, there is no question that England would take twenty millions of dollars worth of raw silk, annually, from us, as it is admitted by the best judges, that the samples, which have been sent by this country thither, have been decidedly superior to that produced in Europe or China. And in concluding this article, we would ask the reader to contemplate the immense benefits which would result to us from the equalization of the exchange between us and England, which would be thus produced.

Exhibit of the value of Silks, imported and exported, from 1821 *to* 1837, *inclusive.*

Year.	Imported.	Silks.	Exported.
1821	$4,486,924		1,057,243
1822	6,840,928		1,016,262
1823	6,718,444		1,512,449
1824	7,204,588		1,816,325
1825	10,299,743		2,590,381
1826	8,327,909		3,367,015
1827	6,712,015		1,871,276
1828	7,686,640		1,270,461
1829	7,192,698		956,925
1830	5,932,243		1,061,054
1831	11,117,946		1,186,129
1832	9,248,907		1,337,073
1833	9,498,366		1,322,372
1834	10,998,964		1,036,057
1835	16,687,547		758,900
1836	22,980,212		762,730
1837	14,352,823		1,207,802

Treasury Department,
Register's Office, August 31*st*, 1838.

T. L. SMITH, *Register.*

KILLING OF THE CHRYSALIDS.

In page 61, several methods for destroying the chrysalids are stated; but we prefer the plan recently suggested by Mr. G. B. Smith. It consists in suffocating them with *charcoal;* that is, by shutting them up in a close room in which a pot of burning charcoal is placed.

SEPARATION OF THE MOTHS.

It is stated in page 61 that the male moth should not be permitted to remain coupled with the female more than six hours. This is the plan recommended by Count *Dandolo*, but upon mature reflection, we incline to the opinion that the period of separation should be left to the parties themselves, as *nature* will tell them *when* their union should cease. If thus left to decide the matter at issue, we are confident that there would be a great deal fewer unimpregnated eggs.

A TABLE, *shewing the gross value of product at different prices of an acre, planted in Morus Multicaulis, at certain distances.*

Distances.	*No. of Trees on an acre.*	*Amt. at 10 cts. each.*	*Amt. at 20 cts. each.*	*Amt. at 30 cts. each.*	*Amt. at 50 cts. each.*
4 by 1 ft.	10,890	$1,089 00	$2,178 00	$3,257 00	$5,445 00
4 by 1½	7,260	726 00	1,452 00	2,178 00	3,630 00
4 by 2	5,445	544 50	1,089 00	1,633 50	2,722 50
4 by 3	3,630	363 00	726 00	1,089 00	1,815 00
3 by 3	4,845	484 50	969 00	1,452 00	2,422 50

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